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Polk Inlet Timber Sale

Final Environmental Impact Statement

Volume I

Foster Wheeler Environmental Corporation
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Polk Inlet Environmental Impact Statement

Final Environmental Impact Statement

Polk Inlet

United States Department of Agriculture
Forest Service—Alaska Region
Alaska

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Abstract

The Forest Service proposes to harvest approximately 125 million board feet (MMBF) of timber in the Polk Inlet Project Area. Timber volume would be offered to the Ketchikan Pulp Company (KPC) under the KPC Long-term Timber Sale Contract or to other timber companies under the Ketchikan Area Independent Timber Sale Program. The actions analyzed in this EIS are designed to implement direction contained in the Tongass Land Management Plan (TLMP 1979a, as amended) and the Tongass Timber Reform Act. They also propose management consistent with the standards and guidelines of the TLMP Draft Revision Supplement (1991a). The Final EIS describes six alternatives which provide different combinations of resource outputs and spatial locations of harvest units. The alternatives are: (1) No Action, proposes no new harvest from the Project Area at this time; (1a) No Action/No Harvest, proposes no timber harvest from the Project Area effective on the date of the signing of the Polk Inlet Record of Decision (March 1995); (F2) gives consideration to all scoping issues, with emphasis on wildlife habitat, subsistence, timber economics, and visual/recreation issues; (3) provides for the harvest of all available timber in the Primary Sale Area (PSA) and include only enough units outside the PSA to bring the volume close to 125 MMBF; (4) emphasizes timber economics and conventional cable yarding in bringing volume close to 125 MMBF; and (F5) emphasizes retaining contiguous old-growth areas for wildlife habitat.

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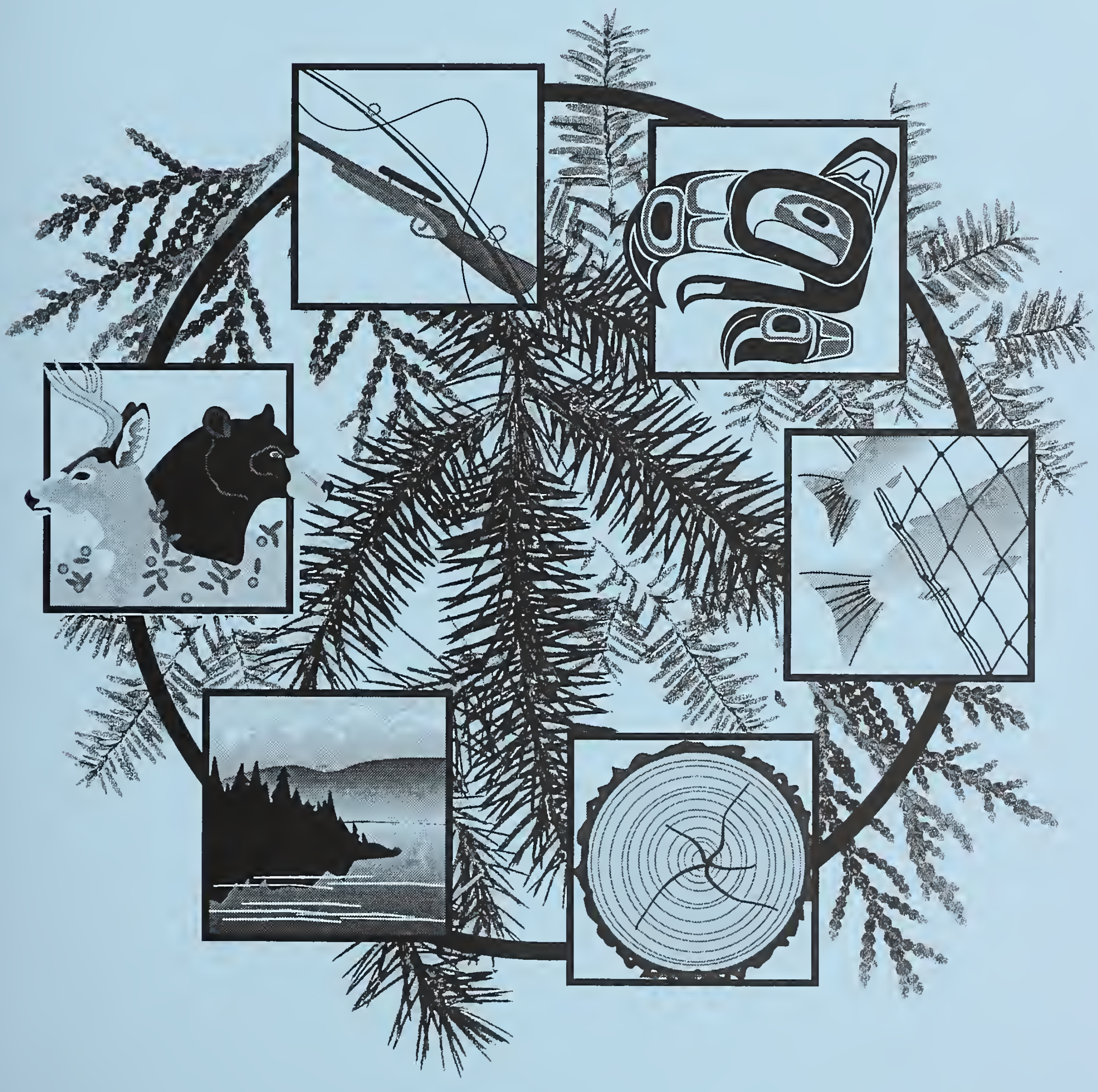


Chapter 1

Purpose and Need for Action

Key Terms

Land Use Designation (LUD)—the method of classifying land uses presented in the Forest Plan (Tongass Land Management Plan [TLMP 1979a, as amended]).
MMBF—million board feet.
Management Area (MA)—an area for which management direction was written in the Forest Plan (TLMP 1979a, as amended). Management Areas encompass one or more Value Comparison Units (VCU's).
Offering—a Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a timber sale contract.
Old-growth forest—an ecosystem distinguished by old trees and related structural attributes. Old-growth forests encompass the latter stages of stand development. They typically differ from earlier stages of stand development in a variety of characteristics which may include tree size, accumulation of large dead woody material, number of canopy layers and tree species composition, and ecosystem function.
Primary Sale Area (PSA)—the Ketchikan Pulp Company Long-term Sale Contract is comprised of Allotments E, F, G, Rest of Area E, Rest of Area F, and Rest of Area G. For purposes of this EIS, Allotments E, F, and G constitute the Primary Sale Area and Rest of Areas E, F, and G constitute Contingency Sale Areas. The Project Area is within Allotment G and Rest of Area F.
Scoping process—activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data is needed, and what level of public participation is appropriate.
Tongass Land Management Plan (TLMP)—the 10-year land allocation plan for the Tongass National Forest, also known as the Forest Plan. The TLMP was completed in 1979 and amended in 1986 and again in 1991 (TLMP 1979a, as amended). The TLMP currently is undergoing revision; the Draft Environmental Impact Statement (EIS) for the Proposed Revised Forest Plan was issued in 1990; a Supplement to the TLMP Revision Draft EIS was issued in 1991 (TLMP Draft Revision 1991a). Reference in the Polk Inlet EIS to the TLMP Draft Revision is to the Draft EIS as proposed to be supplemented by Alternative P of the Supplement, unless otherwise noted. Until the Draft Revision is approved, the TLMP as amended remains in effect.
Value Comparison Unit (VCU)—areas that generally encompass a drainage basin to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Introduction

In compliance with the National Environmental Policy Act (NEPA) and other relevant State and Federal laws and regulations, the Forest Service has prepared this Environmental Impact Statement (EIS) on the effects of timber harvest in the Polk Inlet Project Area (Figure 1-1) on Prince of Wales Island, Alaska. The proposed action would make approximately 125 million board feet (MMBF) of timber available for harvest to (1) the Ketchikan Pulp Company (KPC) under its Long-term Timber Sale Contract with the Forest Service (Ketchikan Pulp and Paper Co. 1951, as amended in 1991), or (2) the Ketchikan Area independent timber sale program. The EIS discloses the direct, indirect, and cumulative environmental impacts and any irreversible or irretrievable commitment of resources that would result from each alternative proposed.

Decision to be Made

Based on the information in this EIS, the Forest Supervisor will decide whether and when to make timber available for harvest and how much to make available. The Forest Supervisor can decide to (1) select one of the alternatives presented in the Final EIS, (2) modify an alternative as long as the environmental consequences of that action have been fully analyzed in the Final EIS, or (3) reject all alternatives and request further analysis. If an alternative is selected, it will be documented in the Record of Decision (ROD).

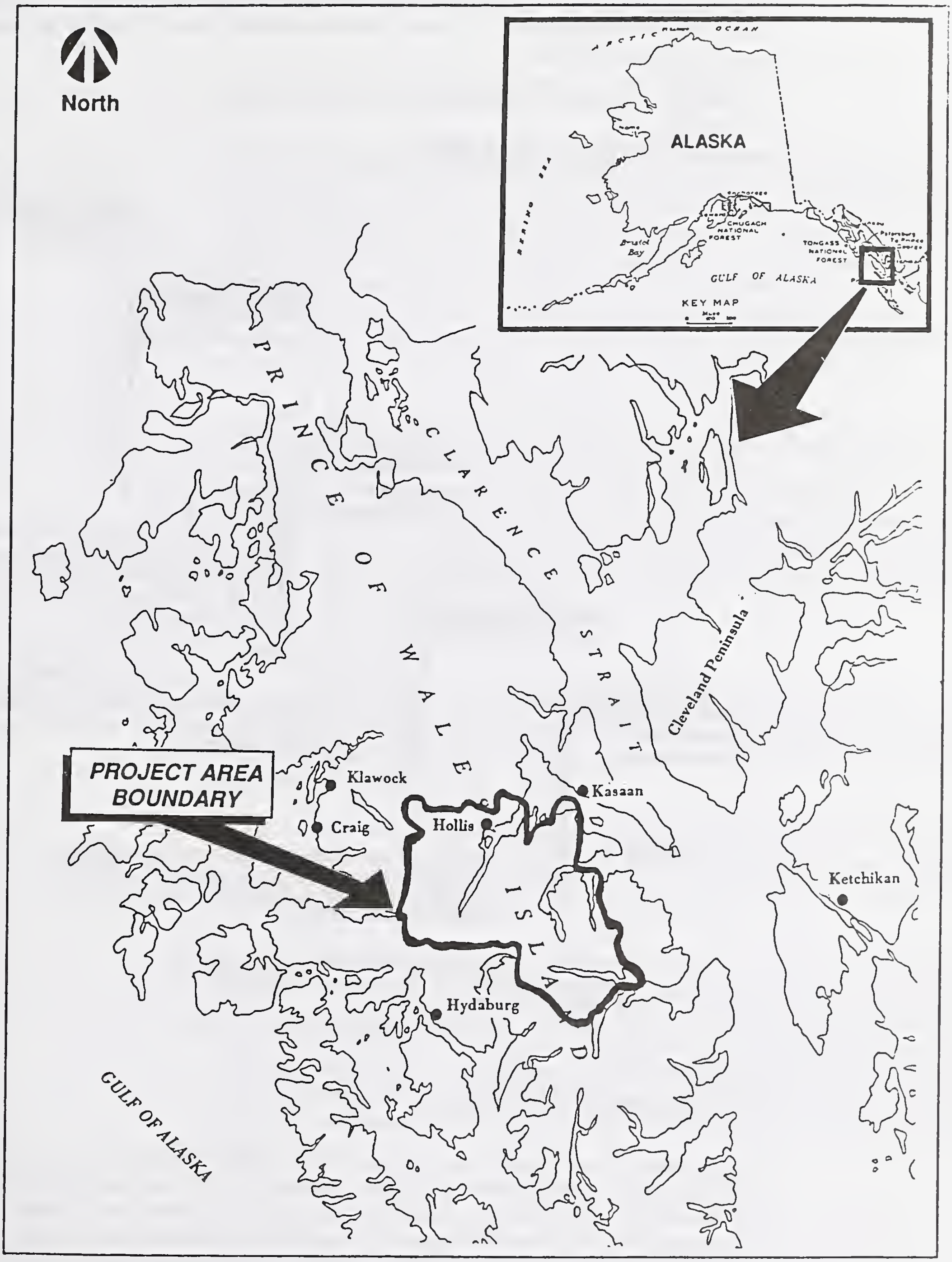
Document Organization

This EIS is prepared according to the format (Figure 1-2) established by Council on Environmental Quality (CEQ) regulations implementing NEPA. Chapter 1, in addition to explaining the purpose and need for the proposed action, discusses how the Polk Inlet Project relates to the Forest Plan and to other related NEPA actions, the key issues driving the EIS analysis, and the authorities guiding the EIS process. Chapter 2 describes and compares the alternatives for accomplishing the proposed action and the no-action alternatives. Chapter 3 describes the environment potentially affected by the proposed activities. Chapter 4 details the anticipated effects of the alternatives on the natural and human environment in the Project Area and throughout Southeastern Alaska. Chapter 5 contains the references cited throughout this EIS. Chapter 6 is a glossary of technical terms. Chapter 7 presents a list of agencies, organizations, and individuals to whom this EIS is sent. Chapter 8 is a list of preparers. Finally, Chapter 9 provides an index to key terms used in this EIS. Finally, a series of appendices provides helpful references to understanding the EIS.

Project Area

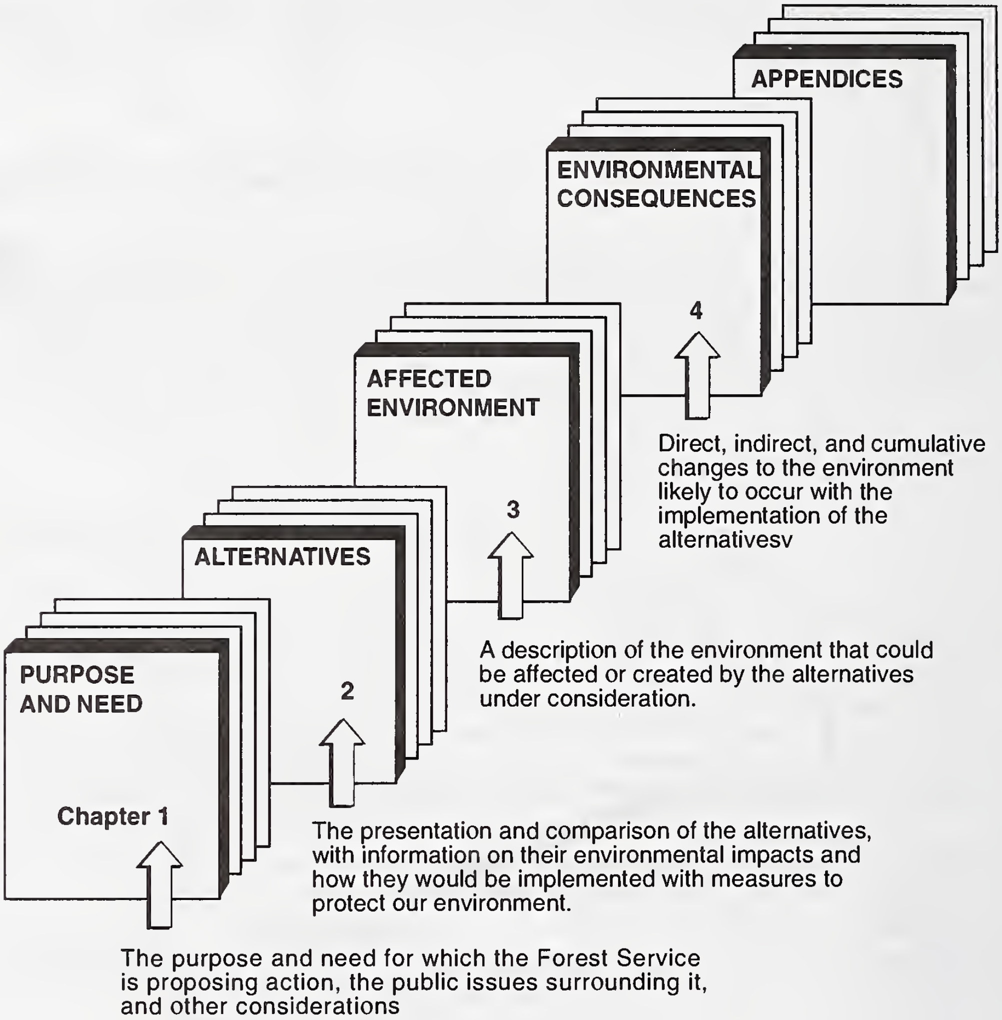
The 208,649-acre Polk Inlet Project Area is located on Prince of Wales Island, approximately 40 air miles west of Ketchikan, Alaska (Figure 1-1). It is near the communities of Hydaburg, Craig, and Klawock on the west side of Prince of Wales Island, and includes the small community of Hollis, which is a ferry terminal site, and the logging camp of Polk Inlet. Access to Prince of Wales Island is by small plane or ferry generally originating in Ketchikan. With the exception of Kasaan, communities within or near the Project Area all are connected by the

Figure 1-1
Project Area



State road system; tributary Forest System roads provide additional access to the Twelvemile and Polk Inlet areas. Also within the Project Area is the Maybeso Creek drainage, a designated Experimental Forest established to study the effects of timber harvest activities on various landforms and fish habitats, and the Old Tom Creek Research Natural Area, designated to allow natural processes to evolve without measurable human influence for research and development purposes.

Figure 1-2
How This EIS is Organized



Proposed Action

The proposed action would harvest approximately 125 MMBF of timber from an estimated 4,500 acres within Management Areas (MA's) K17 and K18. Timber sale offerings from this harvest will be made available to the KPC or the Independent Timber Sale Program. Approximately 50 miles of new roads would be constructed to facilitate timber removal. Up to five existing log transfer facilities (LTF's), including those authorized for the 1989-94

operating period, and up to two newly constructed facilities would be used to implement the action alternatives. The proposed action is consistent with implementation of the Forest Plan known as the Tongass Land Management Plan (TLMP 1979a, as amended) and with the proposed revision (TLMP 1991a).

Purpose and Need for Action

The purpose and need for action is to (1) provide timber volume that will contribute to a 3-year current timber supply requirement of the KPC contract (Section BO.61) and/or to the Ketchikan Area Independent Timber Sale Program, and (2) move toward the desired future condition as identified in the TLMP Draft Revision (1991a), consistent with the Management Direction/Emphasis for each management area in the current Forest Plan (TLMP 1979a, as amended). The alternatives and actions considered in this analysis are possible approaches to meeting this purpose and need. The EIS study process is designed to help ensure that, in meeting the purpose and need, the Forest Service makes the most informed decision possible for this Project Area specifically, and for the Tongass National Forest generally.

The timber volume determined for the Polk Inlet Project Area is approximately 125 MMBF, a volume that reflects management direction based on the current schedule to provide a 3-year timber supply for the KPC Long-term Contract (see Appendix A). There is also a need to contribute to the obligation set by Congress under Section 101 of the Tongass Timber Reform Act (TTRA) of 1990, directing the Forest Service to, "to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which meets annual market demand. . . ."

KPC Long-term Timber Sale Contract

Background

On July 26, 1951, the Forest Service signed a Long-term Timber Sale Contract with the KPC. The contract authorizes the KPC to purchase up to approximately 8.25 billion board feet (BBF) of timber throughout the contract area (Figure 1-3) in the Tongass National Forest through the year 2004.

Timber is to be provided to the KPC from six allotment areas (Figure 1-3) in the Ketchikan Administrative Area: Allotments E, F, and G (KPC Contract Section BO.3, referred to as the Primary Sale Area [PSA] in this EIS); Rest of Area E; Rest of Area F; and Rest of Area G (KPC Contract Section BO.31).

While the Long-term Contract did not restrict KPC timber harvest to the PSA alone, the PSA was specifically designated for use by KPC (KPC Contract Section BO.3). The Long-term Contract was divided into 5-year operating periods in the mid-1960's. It required redetermination of payment rates every 5 years and development of an operating plan that described the timber harvest and associated activities that would likely take place during that 5-year period. A single EIS for all contract operations had to be prepared for each of the 5-year operating plans. The most recent is the 1989-1994 Operating Period Long-term Sale EIS (Forest Service 1989b).

Figure 1-3
Contract Area

Allotment E, F, G (Primary Sale Area)

Rest of E, F, G (Contingency Sale Area)

List of Recent and Current Timber EIS

No.	EIS	Year
1	N. Sea Otter Sound	1992
2	Central Prince of Wales	1993
3	North Revilla	1993
4	Lab Bay	1993
5	Polk Inlet	1993
6	Heceta	1994
7	Control Lake	1994

Scale in Miles
-5 0 25

SOURCE: Forest Service, Ketchikan Area, database.

KPC Contract Modifications Resulting from TTRA

On November 28, 1990, President Bush signed into law the Tongass Timber Reform Act (TTRA, Public Law 101-626). Among other provisions, Section 301 of the Act imposed unilateral changes to the Long-term Contract with KPC to make it more consistent with independent National Forest timber sale programs. Offerings made 90 days after the signing of the Act must comply with the requirements of TTRA including proportionality, streamside buffers, and other provisions. Under the terms of the modified contract, the Forest Service is to provide timber from designated "timber offering areas." Offering areas may vary in size, largely depending on logical transportation systems and the amount of timber necessary to meet contract requirements. Offering areas are to be managed like independent timber sale areas. These timber offerings are made according to a schedule that allows the NEPA process to be completed in time to provide a timber supply sufficient for, "at least three years of operations hereunder or until the contract termination date, whichever occurs first, and which meets the production requirements of [KPC's] manufacturing facilities" (Ketchikan Pulp and Paper Co. 1951, as amended in 1991). This contrasts with the former policy of preparing a single EIS for all contract operations for the 5-year operating periods.

Contract Obligations

The total timber harvest called for under the Long-term Contract is up to approximately 8.25 billion board feet. Analysis indicates that KPC needs to harvest an average of 205 MMBF per year to complete the contract. Four timber projects—North Revilla, Central Prince of Wales, Lab Bay, and Polk Inlet—were initiated for the KPC Long-term Contract within the PSA, as directed by the contract, to seek to find timber supplies within the PSA before seeking volume within contingency areas. These four projects are needed to produce sufficient volume to provide KPC with 205 MMBF for the 1993 logging season, as well as to provide a 3-year timber supply of 615 MMBF. The desired timber supply is, therefore, 820 MMBF.

When these four projects were initiated, approximately 120 MMBF of timber volume was expected to remain from a previous NEPA project (1989-94 LTS EIS) which would be available to KPC by the time the Polk Inlet Final EIS is released. Therefore, it was determined that these four projects need to produce a total of 700 MMBF, which when combined with the 120 MMBF currently available, would provide volume for the 1993 logging season, plus would contribute to maintaining a 3-year timber supply.

This 700 MMBF was divided among the four timber projects based on the size of the project areas, as well as on their relative abilities to produce timber volume in an expedient fashion. Other factors considered in making this volume determination for the Polk Inlet Project included: (1) this harvest level is consistent with the sale schedule in the TLMP (1979a, as amended); (2) sufficient volume has been determined to be available in the Polk Inlet Project Area; (3) there is an extensive road network in place; (4) the number and location of Log Transfer Facilities (LTF's) is sufficient to handle this volume of timber within a 3-year time frame; (5) there are existing KPC-operated logging camps within the Polk Inlet area to handle this volume; and (6) the current Forest Plan (TLMP 1979a, as amended) calls for harvest in this project area.

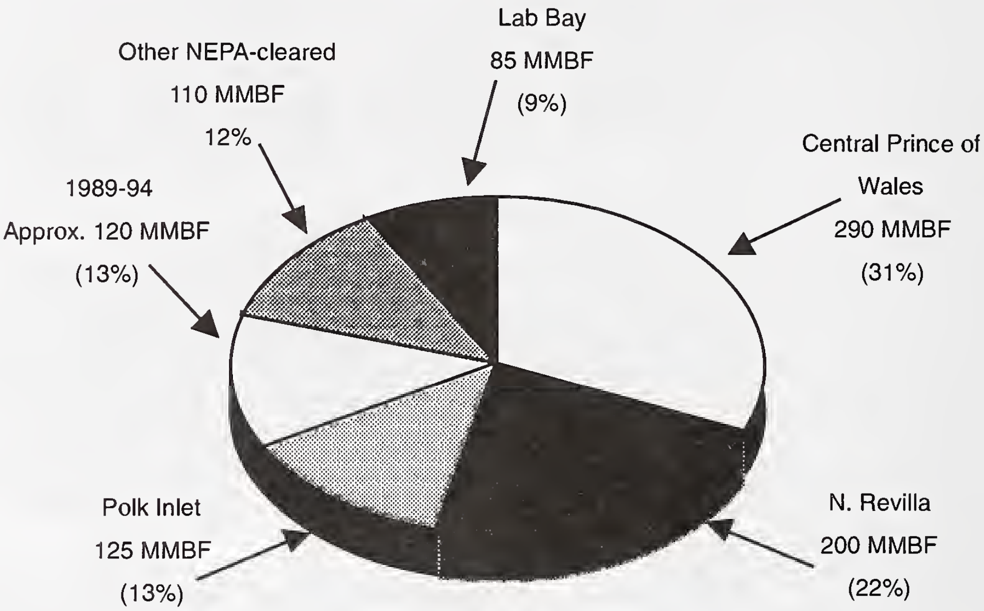
Once these four projects were underway, delays were experienced in their completion. These delays were such that only limited volume could be made available from them for the 1993 logging season. This also had an effect of delaying the time when a 3-year timber supply could be achieved. In an effort to provide enough volume for the 1993 logging season, and to stay on schedule for attaining a 3-year timber supply, four independent sales were released to

KPC. These sales total 107 MMBF and include: Twelvemile (12 MMBF), Frosty (33 MMBF), Shelter Cove (17 MMBF), and Starfish (45 MMBF). Frosty and Starfish are located on the Wrangell District of the Stikine Area.

Figure 1-4 illustrates the current and projected timber supply for the Long-term Contract with KPC.

Figure 1-4

Contribution of Offering Areas to Contract Obligation



SOURCE: 1989-94 EIS.

Why the Polk Inlet Project Area was Selected

In accordance with the background described above, the Polk Inlet Project Area was selected for environmental analysis for the following reasons:

- Management Area (MA) K17 is within the designated PSA Allotment F of the KPC Long-term Contract. MA K17, along with other areas scheduled for harvest (e.g., Central Prince of Wales, North Revilla, Lab Bay) (Figure 1-3) constitute the remainder of the PSA. Scheduling harvest in MA K18 moves to the next step as stipulated in the KPC contract, namely harvest in, "additional cutting areas" outside the PSA. The Polk Inlet Project Area contains a sufficient amount of harvestable timber volume under the Forest Plan. Available information indicates that harvest of the amount of timber being considered for this project can occur within the Forest Plan (TLMP 1979a, as amended; TLMP 1991a) standards, guidelines, and other requirements for resource protection.

- Other areas with available timber inside the designated sale area have or will be scheduled for harvest during the remainder of the KPC contract term to meet contract volume requirements (Figure 1-3). The sequence in which these areas are harvested would cause little difference in the effect on subsistence resources. Harvesting other areas on the Tongass National Forest would likely have similar potential effects on resources, including those used for subsistence, because of the widespread distribution of subsistence use. Harvest of these other areas is probable, in any case, over the forest planning horizon under either the existing or Draft Revision Forest Plan.

- Providing substantially less timber volume than required by the KPC contract to avoid harvest in the Polk Inlet Project Area or other project areas would not meet contract obligations and would not fully implement the Forest Plan.

- It is reasonable to schedule harvest in the Polk Inlet Project Area now rather than in other areas in terms of:
  - previous harvest entry and access,
  - effects on subsistence, and
  - ability to complete the NEPA process and make timber available to meet contract requirements by the time it is reasonably necessary to do so.

For additional details on why the Polk Inlet Project Area was selected, see Appendix A.

The 700 MMBF was divided among the four timber projects based on the size of the project areas, as well as on their relative abilities to produce timber volume expeditiously. Other factors considered in making this volume determination for the project included: (1) a harvest level consistent with the sale schedule in the TLMP (TLMP 1979a, as amended); (2) sufficient volume available in the Project Area; (3) developments including a road network and most LTF's already in place; (4) low subsistence use in the Project Area relative to other project areas; and (5) harvest in this Project Area called for by the current Forest Plan (TLMP 1979a, as amended). As previously stated, the proposed harvest volume of 125 MMBF in the Polk Inlet Project Area reflects management direction (Notice of Intent 1991, revised 1992) based on the above criteria.

TONGASS LAND MANAGEMENT PLAN (TLMP)

TLMP, as amended

The original TLMP of 1979 was amended in 1986 and 1991. TLMP, as amended, refers to the 1991 amendment.

TLMP Draft Revision

As required by NFMA, the TLMP Draft Revision EIS was completed in 1990. TTRA required a supplement to the revision, which was completed in 1991. This EIS references the TLMP Draft Revision Supplement of 1991.

This EIS is tiered to the TLMP, as amended in 1991, and calls for management consistent with the TLMP Draft Revision Supplement, 1991.

Existing Condition and Management Emphasis (Desired Future Condition)

The Project Area covers 208,649 acres of land, including 19,848 acres in State, Native corporation, and private ownership, and 19,867 acres of lands encumbered through selection by the State and Native corporations. The remaining 168,934 acres of National Forest System land consist of: 9 percent in nonforest, including muskegs, rock outcrops, and alpine; 38 percent in noncommercial forest, including forested muskeg and low productivity subalpine forest; and 53 percent (90,060 acres) in commercial forest land. Seventy-six percent of the commercial forest lands are old-growth stands and 24 percent (21,975 acres) are in second growth, having been harvested over the past several decades.

The Project Area provides habitat for many wildlife species including Sitka black-tailed deer, black bear, marten, otter, and bald eagle. Streams and streamside habitats support several species of salmon, Dolly Varden char, trout, and other anadromous and resident fish that are important for sport and commercial fishing and for subsistence use. The Project Area provides settings for many types of outdoor recreation including fishing, big game hunting, scenic viewing, automobile travel, motor boating, and hiking. An extensive road system provides recreation and employment activities for the communities surrounding the area including

Hollis, Craig, Klawock, Hydaburg, and Thorne Bay. The visual character of the Project Area is an important resource for tourism development and, therefore, to the economic wellbeing of the area. The existing condition of the Project Area is described in detail in Chapter 3 of this EIS.

As the Forest Plan is implemented, the condition of the forest will change in some areas as a result of management activities, while other areas will remain essentially as they are today, subject only to natural processes. The application of any particular land use designation (LUD) to an area carries with it certain desires for the future condition of that area.

The Forest planning process undertaken for the current Forest Plan (TLMP 1979a, as amended) specifies the desired future condition through the Management Direction/Emphasis established for each Management Area. This Management Direction/Emphasis contains information about conditions and intents to be considered in undertaking management activities in each Management Area. More than half of the Forest was anticipated to remain in a basically unmodified state over time if current Land Use Designations remained unchanged. For specific management emphasis and direction for each Management Area in the Polk Inlet Project Area (K17 and K18), see TLMP as amended in 1985-86 (TLMP 1986a).

The management emphasis and direction was further refined as the desired future condition specific to each LUD in the TLMP Draft Revision (1991a). Under Alternative P of the TLMP Draft Revision, the desired future condition of the majority of the Tongass National Forest (60 percent) will remain relatively unmodified, allowing natural processes to determine future conditions; another 8 percent will be left in a near-natural state; 12 percent will be subject to moderate amounts of timber harvest while maintaining scenic quality; and 20 percent of the Forest as a whole will be highly modified through timber harvest and other human-induced development over the planning horizon of 150 years (TLMP Draft Revision 1991a).

For the Polk Inlet Project Area, about 60 percent of the nonencumbered National Forest System lands are classified as a Timber Production LUD and, are therefore, subject to modification in the form of timber harvest, road construction, and developed types of recreation. Another 24 percent are classified as Modified Landscape or Scenic Viewshed and will be characterized by moderate amounts of timber harvest that modify the landscape but still maintain a basically natural appearance. Diversity will change, with large areas presenting a mosaic of timber harvest units of varying sizes and ages, crossed by roads and interspersed with areas of old-growth and nonforest vegetation. Old growth will remain in areas that are unsuitable for timber harvest or within areas not programmed for harvest such as portions of the riparian LUD, the beach fringe and estuary LUD, and the Old Tom Research Natural Area. Lands within the Maybeso Experimental Forest will be managed to provide a variety of long-term opportunities for forest research and demonstration essential to managing forest resources.

Achievement of the desired future condition will require many decades. It will be reached by applying integrated resource management practices that are responsive to site-specific conditions such as those represented in the Polk Inlet Project Area. The action alternatives analyzed in this EIS provide different ways of moving toward the Forest Plan desired future condition in the Project Area.

The Decision-making Process

National Forest planning involves several levels of decision. The decision-making begins with long-range planning at the national level, continuing down through the regional and forest levels to the project level. The Polk Inlet Project is a part of this process. This EIS is a project-level analysis; as such, it does not attempt to address decisions made at higher levels. It does, however, implement direction provided at those higher levels. Specifically, the Polk Inlet Project would implement direction in the Forest Plan.

National Level

The 1990 Program and Assessment as directed by the Forest and Rangeland Renewable Resources Planning Act of 1974 (Resources Planning Act), as amended, provides national direction for resource allocations and targets. An assessment of the forest and rangeland renewable resources is required every 10 years and development of a program for managing those resources is required every 5 years.

Regional Level

The Alaska Regional Guide (1983) addresses regional issues specific to Alaska, establishes management standards and guidelines, and displays resource outputs for the Tongass National Forest. The TLMP takes into account this regional direction.

Forest Level

The National Forest Management Act of 1976 (NFMA) directs each National Forest to prepare an overall plan of activities. The Forest Plan provides land and resource management direction for the Forest. It establishes LUD's to guide management of the land for certain uses. The LUD's describe the activities that may be authorized within the Value Comparison Units (VCU's), the boundaries of which usually follow easily recognizable watershed divides.

For the Tongass National Forest, the Forest Plan is the Tongass Land Management Plan (TLMP) of 1979, as amended in 1986 and again in February 1991 as a result of the Tongass Timber Reform Act (TTRA). The Forest Plan currently is undergoing revision as required by the NFMA. A Supplement to the TLMP Draft EIS (the Draft Revision) was issued in 1991 (TLMP Draft Revision 1991a). Until the ROD for the Draft Revision is signed, the TLMP as amended (TLMP 1979a, as amended) remains in effect.

Project Level

The 1989-94 Long-term Sale Contract EIS was the most recent EIS addressing the KPC Long-term Contract within the Project Area. It provided for timber harvest, road construction, and log transfer facility (LTF) development in many parts of the Project Area and is currently being implemented.

The Polk Inlet EIS tiers to the TLMP EIS (TLMP 1979a, as amended) and the Alaska Regional Guide EIS (1983). It also proposes management consistent with the preferred alternative (Alternative P) in the Draft Revision (TLMP Draft Revision 1991a). Documented analysis in TLMP or the TLMP Draft Revision is referenced rather than repeated in some instances in this EIS. In cases of conflicting direction, the most restrictive standards and guidelines were applied.

To implement the Forest Plan, an interdisciplinary (ID) team of resource specialists evaluated management opportunities in the Polk Inlet Project Area, conducted scoping activities, formulated alternative ways to implement the proposed action, analyzed the environmental consequences of such actions, and evaluated and compared the alternatives based on their environmental consequences. Based on this entire environmental study and analysis, the Forest

Supervisor will decide whether and how to make timber available from the Polk Inlet Project Area to contribute to KPC contractual commitments and to the Independent Timber Sale Program. Forest Supervisor decisions will include:

- The timber volume to make available under the contract from this Project Area;
- The location, design, and schedule of timber harvest, silvicultural, road construction, and reforestation management practices;
- Access management measures (road, trail, and area restrictions and closures); and
- Mitigation measures, Best Management Practices (BMP's), and monitoring measures.

Other NEPA projects proposed in the Ketchikan Area to meet the Long-term Timber Sale Contract requirements and provide offerings for the Independent Timber Sale Program are shown in Table 1-1.

Table 1-1

Timber Harvest Projects Proposed for Fiscal Years 1993 through 2000

Year Complete	EIS Name	Management Area	MMBF
1993	Central Prince of Wales	K03, K07, K08, K09, K10	290
1993	North Revilla	K32	200
1995	Polk Inlet	K17, K18	125
1996	Lab Bay	K01, K03	85
1996	Control Lake	K05, K08	187
1996	Upper Carrol	K32	130
1996	Sea Level	K35	67
1995	Heceta	K11	75
1995	Three Creeks	K39	49
1996	Vixen Inlet	K29	175
1996	Port Stewart	K30	135
1997	Chasina	K24	166
1997	Ratz	K09	40
1997	Tuxekan	K07	59
1998	North Prince of Wales	K01, K03	103
1998	Moira	K25	119
1999	Honker	K08	119
1999	South Prince of Wales	K28	80
2000	Lower Carrol	K34, K35	41
2000	Cholmondeley	K18, K19	75
2000	Luck Lake	K08, K09	107

SOURCE: Memo to Forest Supervisor, USDA Forest Service, April 26, 1993.

Forest Plan Land Management

The Polk Inlet Project Area includes Forest Plan VCU's 610 through 613, 618 through 622, 624, 674, and 675 (Figure 1-5). These VCU's, in combination, make up MA's K17 and K18. The entire Project Area contains approximately 188,801 acres of National Forest System land of which approximately 90,060 acres, or about 48 percent, is estimated to be operable commercial forest land, which is land from which timber may be harvested for commercial sale. Land management planning for the Forest is similar to city zoning. Just as areas of a city are zoned for different use—commercial, industrial, residential—the Forest is also "zoned" to allow or not allow various uses and activities. The management direction in the Forest Plan (TLMP 1979a, as amended) contains goals for many of the Forest's resources and uses, including timber, recreation, subsistence, cultural resources, visual quality, fish and wildlife habitat, and transportation. More than half of the Forest is to remain in a basically unmodified state over time if current LUD's remained unchanged. For specific management emphasis and direction for each management area in the Polk Inlet Project Area, see TLMP as amended in 1985-86 (TLMP 1986a).

Land Use Designations

The current TLMP (1979a, as amended) designates areas appropriate for various activities through four LUD's. The proposed TLMP Draft Revision (1991a) would provide more specific management direction by subdividing the Project Area into refined LUD's and by applying specific standards and guidelines. This EIS also utilizes the standards and guidelines presented in the TLMP Draft Revision (1991a).

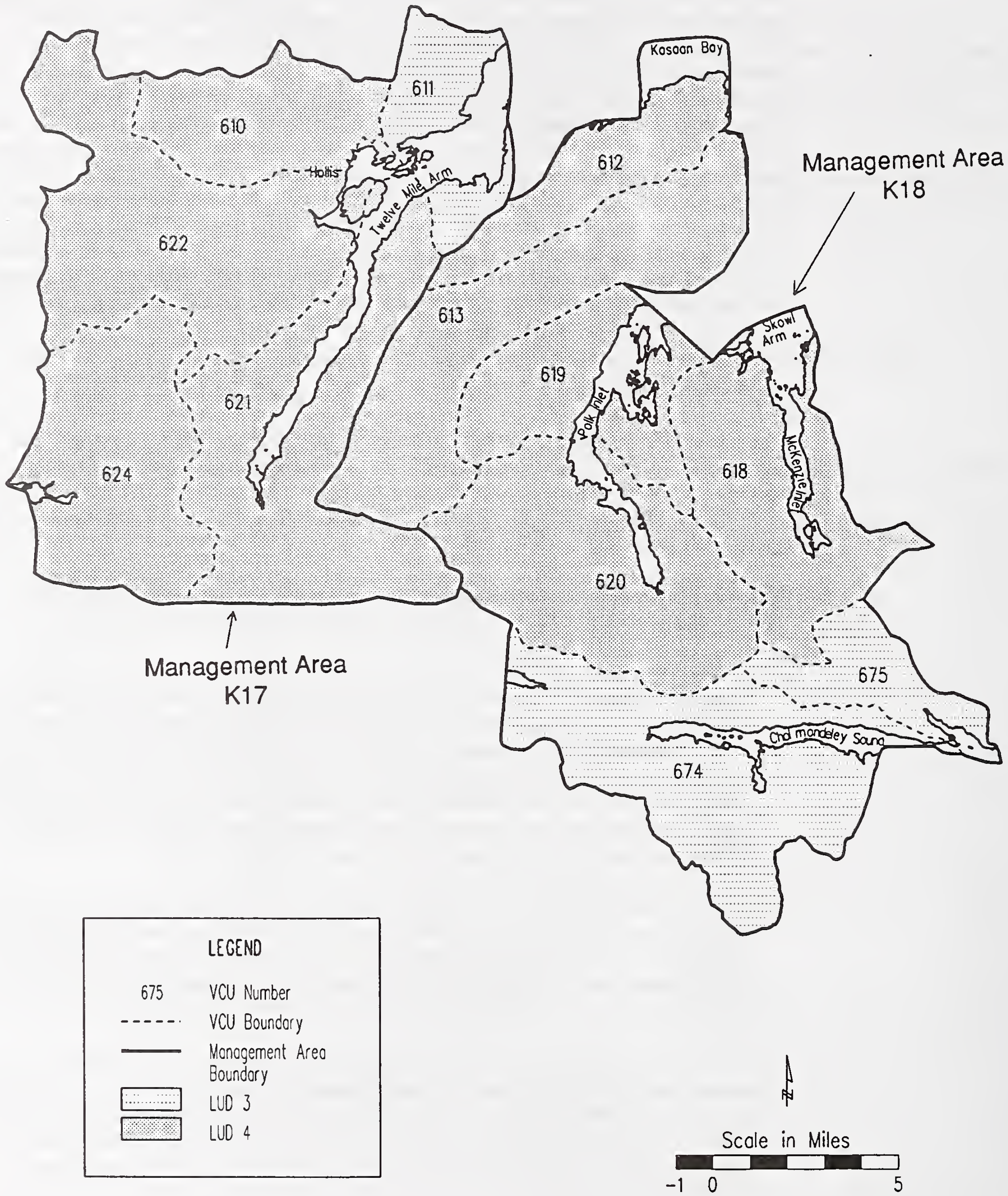
The Polk Inlet Project Area is allocated to LUD's III and IV (Figure 1-5), described below. Full definitions of all LUD's are presented in the current TLMP (1979a, as amended).

- LUD I—These lands consist of wilderness areas and nonwilderness areas designated as National Monuments. Wilderness areas are to be managed to provide for the following uses: fishing, hunting, trapping, subject to State Fish and Game regulations; subsistence uses; public recreation cabins; structures and facilities under special use permit and/or public use; fish habitat enhancement; access to private, State, and Native lands; use of airplanes, motor boats, and snow machines; and beach log salvage, subsistence, and recreation use of timber. National Monument lands are to be managed to protect objects of ecological, cultural, geological, historical, prehistorical, and scientific interest.

- LUD II—These lands are to be managed in a roadless state to retain their wildland character. This would permit wildlife and fish habitat improvement and primitive recreational facility development. The following are prohibited in LUD II areas: (1) roads, except for specifically authorized uses; (2) timber harvesting, except for controlling insect infestations or to protect other resource values; (3) major concentrated recreational facilities.

- LUD III—LUD III lands are to be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complementary manner to provide the greatest combination of benefit. These areas have either high use or high amenity values in conjunction with high commodity values. Allowances in calculated potential timber yield have been made to meet multiple objectives. These lands may include concentrated recreational developments.

Figure 1-5
VCU's, MA's, and TLMP LUD's



SOURCE: TLMP 1979a, as amended.

The Project Area contains 36,917 acres of LUD III lands in VCU's 611, 674, and 675.

- LUD IV—Opportunities are to be provided in LUD IV areas for intensive resource use and development where emphasis is primarily on commodity or market resources. Allowances in calculated potential timber yields have been made to provide for protection of physical and biological productivity.

  The Project Area contains 151,884 acres of LUD IV lands in VCU's 610, 612, 613, 618, 619, 620, 621, 622, and 624.

The proposed TLMP Revision (TLMP 1991a) would refine these LUD's. For example, LUD IV areas, for the most part, would become Timber Production (TM) lands, while areas currently designated LUD III would be somewhat more refined into Scenic Viewsheds (SV) or Modified Landscape (ML). It supplements management direction through detailed management prescriptions and standards and guidelines. There are 23 LUD's identified in the TLMP Draft Revision, 7 of which apply to the Polk Inlet Project Area. References in this document to the TLMP Draft Revision will mean Alternative P of the Revision Supplement to the Draft EIS, unless otherwise noted. The 7 Project Area LUD's and 2 additional land use categories are described below.

- Beach Fringe and Estuary (BF)—Beach fringe and estuary habitats are managed to favor wildlife, fish, recreation, visual and other resources associated with beach fringe and estuary areas. Areas included are 500 feet from beaches and 1,000 feet from estuaries. These areas are managed in near-natural, undisturbed habitat conditions. Timber harvest is not allowed and cutting on the upland is discouraged; if allowed, it is limited to designated areas. The BF's are contained within other LUD's. The Project Area contains approximately 5,940 acres of BF.

- Stream and Lake Protection (Riparian) (SL)—This LUD emphasizes maintaining riparian habitat for fish and other riparian-associated resources. It applies to areas comprised of aquatic and riparian ecosystems, including riparian streamsides, lakes, and floodplains. These areas often provide snags for wildlife, maintain large trees for riparian-associated species, provide waterfowl habitats associated with riparian areas, and provide wildlife travel corridors. Commercial timber harvest is prohibited within a minimum of 100 feet of all Class I streams and those Class II streams that flow directly into Class I streams. Additional no-cut or partial-cut buffers are established in other areas where timber harvesting conflicts with the maintenance or improvement of riparian-associated resources. Roads are to be located outside of these areas to the extent practicable. Transportation developments should not impair the production and migration of anadromous fish. The SL's are contained within other LUD's. Approximately 18,246 acres of riparian land are within the Project Area.

- Scenic Viewshed (SV)—These LUD's are managed to provide scenic landscapes, vistas, and travel corridors in areas viewed by the public mainly from roads, recreational sites, and waterways. Timber harvest is limited to ensure compliance with visual standards and guidelines. Roads and trails must be compatible with the natural landscape. The Project Area contains approximately 4,878 acres of SV's.

- Modified Landscape (ML)—Modified Landscape LUD's provide a mix of management options, while minimizing the visibility of development activities in the foreground and allowing more development in the middle and background distance where it is farther from the view of forest visitors. Timber harvest and road construction must be designed to meet visual quality objectives. The Project Area contains approximately 38,934 acres of ML areas.

- Timber Production (TM)—The primary purpose of TM areas is to maintain and promote industrial wood production. Timber production activities will be designed to consider fish and wildlife habitat and recreational opportunities. Timber harvest may include both even- and uneven-aged silvicultural methods. Silvicultural treatment is integrated with site and area development to provide healthy tree stands and to consider vegetative diversity and forage production for wildlife. Roads are permitted. The Project Area contains approximately 108,965 acres of TM areas.

- Experimental Forests (EF)—Experimental Forests (i.e., Maybeso Experimental Forest) provide a variety of long-term opportunities for forest research and demonstration essential to managing forest resources. Timber harvest and road construction is allowed for research and demonstration purposes. The Project Area contains approximately 10,499 acres of EF.

- Research Natural Area (RA)—These areas are managed for research and education and/or to maintain natural diversity on National Forest System lands. These conditions normally are achieved by allowing natural physical and biological processes to prevail without human intervention. No timber harvest is permitted. The Project Area contains approximately 4,522 acres of RA.

- Alaska State and Private Lands (PV)—These lands are not designated LUD's. They are lands belonging to the State of Alaska, Native corporations, and private parties. The Project Area contains approximately 19,848 acres of State- and privately owned land.

- Encumbered (EN)—This is not a designated LUD in the Draft Revision TLMP. However, for purposes of this EIS, it designates areas within the Polk Inlet Project Area which have been selected but not yet conveyed to the State or to Native corporations and are not considered in the action alternatives of this project. The Project Area contains 19,867 acres of encumbered land.

Value Comparison Units

The following describes the Polk Inlet Project Area VCU's by LUD's defined in the TLMP Draft Revision (see Figure 1-6). Table 1-2 lists the acres of land within each VCU and Management Area by LUD.

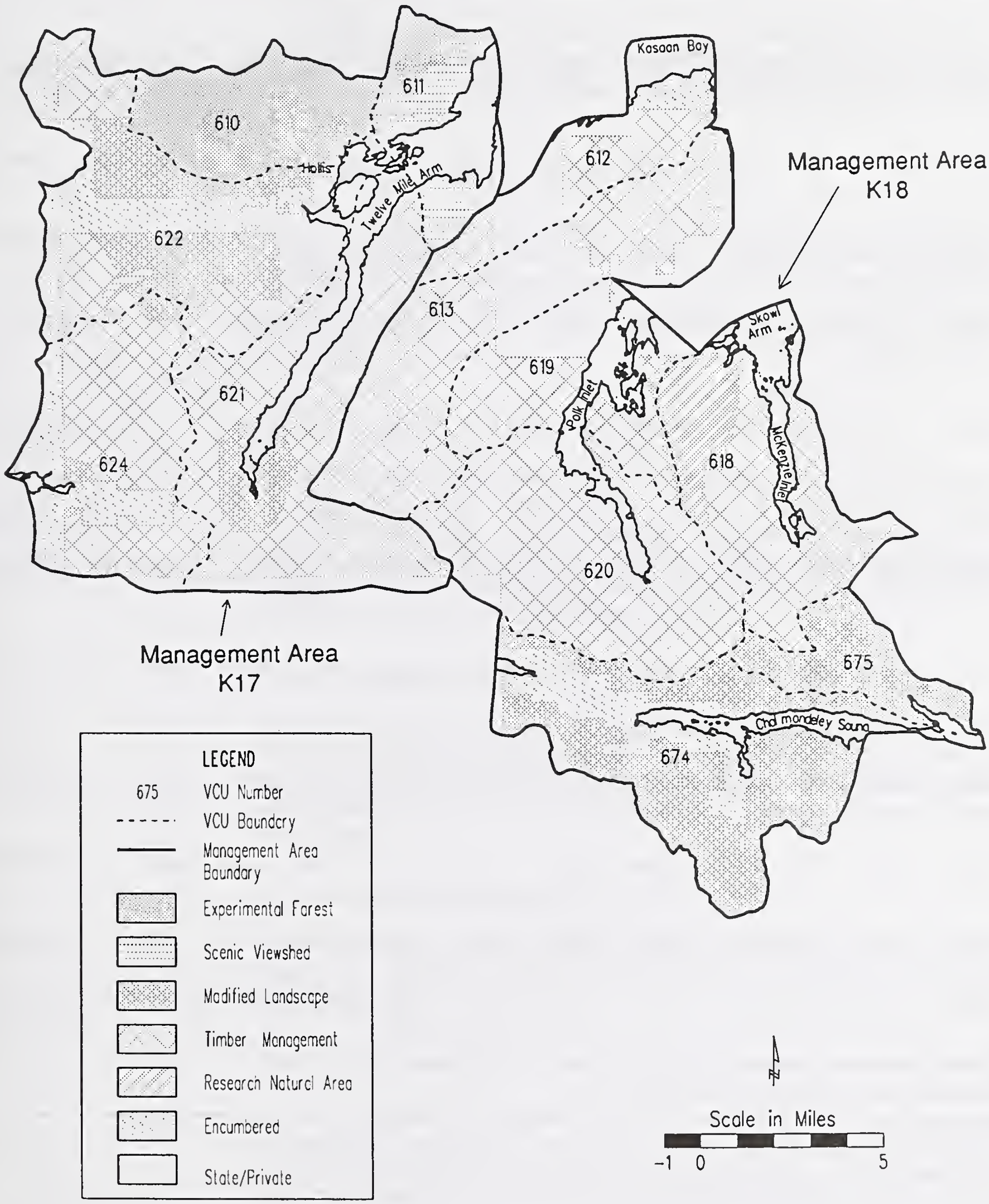
VCU 610—Maybeso Experimental Forest (EF and PV)

This VCU contains the 10,540-acre Maybeso Experimental Forest and two small parcels of private land in the southeast portion of the unit. The Maybeso Experimental Forest, a LUD IV under the current TLMP (TLMP 1979a, as amended), was established to study the effects of timber harvest activities on various landforms and fish habitats. Timber harvest within the boundaries of Maybeso must be coordinated with the research branch of the Forest Service. The VCU has 10,908 acres of nonencumbered National Forest System land.

VCU 611—Outer Point (SV, ML, and PV)

Lands on both sides of Twelvemile Arm in the unit are designated LUD III under the current TLMP. They are proposed to be designated SV under the TLMP Draft Revision, with small areas of State and private lands. Approximately 60 percent of the Scenic Viewshed contains lands designated as suitable and available for timber management. The northern portion of the VCU is designated ML and is adjacent to Karta Wilderness north of the VCU. The VCU has 5,840 acres of nonencumbered National Forest System land.

Figure 1-6
VCU's and TLMP Draft Revision LUD's



SOURCE: TLMP Draft Revision 1991a.

Table 1-2
Land Use Designations (LUD's) by VCU and Management Area (in Acres)

	K17					K18							
LUD	**610**	**611**	**621**	**622**	**624**	**612**	**613**	**618**	**619**	**620**	**674**	**675**	**Total**
Scenic Viewshed	16	4,254	15	361	15	37	0	0	0	0	0	231	4,929
Modified Landscape	266	1,515	2,810	8,990	876	0	0	76	0	127	17,841	6,568	39,069
Timber Production	148	47	20,398	7,925	13,348	5,371	18,365	12,748	8,335	23,197	102	71	110,055
Experi-mental Forest	10,478	24	0	38	0	0	0	0	0	0	0	0	10,540
Research Natural Area	0	0	0	0	0	0	0	4,198	143	0	0	0	4,341
Subtotal	10,908	5,840	23,223	17,314	14,239	5,408	18,365	17,022	8,478	23,324	17,943	6,870	168,934
Beach and Estuary Fringe[1/]	21	374	1,485	0	81	5	1	1,180	701	912	833	347	5,940
Stream & Lake Protection[1/]	1,640	623	2,189	2,255	1,790	701	3,346	2,453	823	3,623	1,972	1,044	22,459
Encumbered Land	210	380	0	7,224	5,008	1,122	24	0	15	0	5,884	0	19,867
State/ Private	250	861	2,003	3,131	285	3,051	5,334	381	3,426	495	620	11	19,848
TOTAL	11,368	7,081	25,226	27,669	19,532	9,581	23,723	17,403	11,919	23,819	24,447	6,881	208,649

SOURCE: Forest Service, Ketchikan Area, database.

1/ Note that areas in these two LUD's are included in the five LUD's above.

VCU 612—Kina Cove Uplands (TP, PV, and EN)

All of the National Forest System land in VCU 612 is designated LUD IV under the current TLMP and is proposed to be designated TP under the Draft Revision. The Sealaska Native Corporation owns approximately 2,900 acres in the unit. The Sealaska land divides the unit into west and east sections and surrounds the eastern units of both VCU 612 and the adjacent 613. Sealaska has conducted extensive timber production operations on its lands. Another 1,122 acres of land is Native selection. The VCU contains 5,408 acres of nonencumbered National Forest System land.

VCU 613—Old Franks Creek (TP, PV)

All of the National Forest System land in VCU 613 currently is LUD IV. It is proposed to be designated TP under the TLMP Draft Revision. The Sealaska Native Corporation owns approximately 5,200 acres and there are about 18,389 acres of nonencumbered National Forest System land. Sealaska land divides National Forest System land into two sections and surrounds the eastern unit of the VCU. Sealaska has conducted extensive timber production on its lands.

VCU 618—Skowl Arm and McKenzie Inlet (RA and TM)

All of VCU 618 under the current TLMP is designated LUD IV. Under the Draft Revision, the majority of the land in the VCU is proposed as TM. The VCU also contains the Old Tom Creek Research Natural Area. The 4,341-acre tract was established as an example of cedar-hemlock old-growth forest including examples of riparian spruce forest, extensive tidal meadows, and dense bald eagle and black bear populations. The VCU contains 17,022 nonencumbered National Forest System land acres.

VCU 619—Upper Polk Inlet (TM and PV)

VCU 619 is located on both sides of upper Polk Inlet and is primarily composed of land proposed to be designated TM and currently designated LUD IV. The northern portions of the unit are owned by the Sealaska Native Corporation, which has conducted extensive timber production on the land. The VCU contains 8,478 acres of nonencumbered National Forest System land.

VCU 620—Lower Polk Inlet (TM)

This VCU, consisting of 23,324 acres of nonencumbered National Forest System land, surrounds lower Polk Inlet. It is currently a LUD IV and is proposed to be designated TM under the Draft Revision.

VCU 621—Twelvemile Arm (ML, TM, and AK)

An area at the south end of Twelvemile Arm is proposed as a ML area under the Draft Revision and small areas around Hollis are State ownership. The rest of the 23,223 acres of nonencumbered National Forest System land that constitute the VCU is proposed to be designated TM. Under the current TLMP, the entire VCU except for the Hollis area is a LUD IV.

VCU 622—Hollis and Harris River (SV, ML, TM, and EN)

VCU 622 contains a variety of land ownership and land uses. Eighty percent of the land in the unit is part of the Tongass National Forest. Sixty percent of this land is proposed to be designated either TM or SV. Nonencumbered National Forest System land constitutes 17,314 acres in this VCU. State selections consist of 7,224 additional acres. Approximately 3,131 acres of State and private lands occur in the Hollis area. National Forest System land in the Harris drainage has been largely designated as ML. Lands on either side of the One Duck Trail and shelter are designated SV as is an area north of One Duck Lake. Except for State and private lands in the Hollis Area, the current TLMP designates this VCU as LUD IV.

VCU 624—Hydaburg Road Corridor and Cable Creek (TM, ML, and EN)

All of this VCU is designated LUD IV under the current TLMP and is proposed for TM designation under the Draft Revision except for a small area of ML on the west side, north of Trocadero Bay. The VCU includes 14,239 acres of nonencumbered National Forest system lands.

VCU 674—West Arm Cholmondeley Sound and Big Creek (ML and EN)

Under the current TLMP, VCU 674 is designated LUD III. Much of the center of the VCU (5,884 acres) is currently Haida Corporation selected land (EN), including the Sulzer Portage, the north and south sides of the head of West Arm, and the west and south sides of the Big Creek estuary and drainage. Both the northern and southern portions of the 24,447-acre VCU have been proposed as ML under the Draft Revision. A small mining claim exists in the southwest portion of the VCU. Nonencumbered National Forest System land consists of 17,943 acres.

VCU 675—Sunny Cove (ML and PV)

Current TLMP designation for VCU 675 is LUD III. The Draft Revision would designate the majority of the 6,870 acres of nonencumbered National Forest System land within VCU 675 as ML. Approximately 11 acres of land located on the northeast side of Sunny Cove are privately owned.

Public Involvement

The NEPA process (40 CFR 1501.7) was followed to determine the scope of the issues to be addressed by the environmental analysis and to identify major concerns related to the proposed action. Scoping and public involvement are ongoing processes used to invite public participation and collect initial comments. Public comment on the Polk Inlet Project was sought through several means, including those described below.

Public Mailing

The Forest Service began public involvement for this project on August 27, 1991, by mailing a scoping package to individuals, government agencies, Native corporations, and interested organizations. The packet contained a description of the proposed action, a map of the Project Area, a form on which comments could be written, and blank spaces for the name and address of those who wished to remain on the project mailing list. A total of 95 individuals responded to the solicitation for input into the scoping process. Thirty individuals, representing themselves or organizations/agencies, provided comments on the project scope. Sixty-five requested that they be placed on the mailing list and did not offer comments.

Notice of Intent (NOI)

A Notice of Intent to prepare an EIS was published in the Federal Register on September 6, 1991. A revised NOI, published on August 18, 1992, continued the scoping process and clarified the boundaries of the Project Area to include all of MA's K17 and K18, including areas outside the KPC Primary Sale Area.

News Media

Newspaper advertisements were placed in the *Ketchikan Daily News* and the *Island News* on September 7, 1991. These advertisements explained the purpose and intent of the project, invited comments on the scope, and solicited names and addresses for inclusion on the project mailing list. A press conference was held October 17, 1991, to discuss current planning projects in the Ketchikan Area of the Tongass National Forest, including the Polk Inlet Project. Two news articles have appeared thus far on the project: (1) on August 27, 1992 in the *Ketchikan Daily News* on finding a marbled murrelet nest and egg shells in the Project Area, and (2) on November 17, 1992 in the *Ketchikan Daily News* on the contents of the first project report (see below).

Project Reports

In November 1992, the first of a series of project reports was mailed to approximately 150 individuals and groups. The report summarized the significant issues derived from the initial public comment and outlined tentative frameworks for development of alternatives to be analyzed in the Draft EIS. It also provided an opportunity for people to add their names to the mailing lists. A second project report was issued on the Draft EIS informing individuals of its contents and of opportunities to comment on its findings.

Consultation

Various meetings and telephone discussions were held from June 1992 through October 1994 between members of the Polk Inlet ID Team and interested parties to provide information and clarification on issues and alternatives. Key meetings and contacts are identified below:

- The following contacts were made to obtain information for the subsistence survey:
  - Ketchikan Indian Corporation (KIC)
  - Saxman Tribal Council
  - City of Kasaan
  - Kasaan Village Corporation (Kavilco)
  - City of Klawock
  - City of Craig
  - City of Hydaburg
  - Hydaburg Fish and Game Advisory Board
- Interviews regarding subsistence and recreation use were conducted with 50 households in and near the Project Area early in the analysis.
- ID Team members met with residents of Hollis at a Community Council meeting on August 12, 1992.
- Several meetings were held with the Craig Ranger District.
- A meeting was held on August 8, 1992 with residents of Cannery Cove.
- Two substantive meetings were held with ADF&G to consult on formulation of the action alternatives and consult on high value wildlife habitats in the Project Area.
- The Alaska Department of Environmental Conservation was consulted on December 8, 1992 with regard to the study process and alternative development.
- The following organizations were also consulted:
  - Tongass Conservation Society
  - Prince of Wales Conservation League
  - Greenpeace Alaska Forests Campaign
  - Southeast Alaska Conservation Council

Ketchikan Pulp Company
Alaska Department of Transportation and Public Facilities
U.S. Fish and Wildlife Service

- Meetings and associated telephone discussions were held with State agencies in Juneau and Ketchikan in September through October 1994 to review their comments on the Draft EIS and proposed responses and old-growth retention strategies.
- Meetings were held with the U.S. Fish and Wildlife Service in September through October 1994 to review the effect of proposed old-growth retention strategies on threatened/ endangered species and candidates.
- Meetings were held with State agencies in Juneau in March 1995 to review the selected alternative.

Draft EIS

Availability of the Draft EIS was announced in the Federal Register on October 8, 1993, with deadline for public comment listed as November 24, 1993. Copies were mailed to all on the Mailing List. Notices of the availability of the Draft and announcing the schedule for subsistence hearings and public open houses were placed in the *Ketchikan Daily News* and the *Island News*. Additional notices to radio stations and newspapers in the region were issued.

Subsistence Hearings and EIS Open House Meetings

Subsistence hearings on the Draft EIS were held on the dates and in the communities listed below. Open houses were also held in conjunction with the subsistence hearings to describe the analysis process and answer public questions on the Draft EIS. Public comment on the Draft EIS was also be accepted at that time. Comments were recorded and transcribed (see Appendix I).

Craig	(Nov. 1, 1993)	Ketchikan	(Nov. 8, 1993)
Hollis	(Nov. 2, 1993)	Klawock	(Nov. 4, 1993)
Hydaburg	(Nov. 3, 1993)	Saxman	(Nov. 9, 1993)
Kasaan	(Nov. 10, 1993)		

Final EIS

Approximately 40 individuals, organizations, and agencies submitted written comments on the Draft EIS. Approximately 370 form letters, some with additional comments, were also received. In addition, 23 verbal testimonies were received at the 7 subsistence hearings. These comments were analyzed and considered in the development of the Final EIS. The 45-day comment period officially closed November 24, 1993, but letters were accepted and comments analyzed beyond this date. Responses to comments were prepared and are presented in Appendix H of this EIS. The Final EIS has been filed with the Environmental Protection Agency and is available to the public.

Issues

Issues Addressed in the EIS

Based on the consultation conducted with members of the public and government agencies, the scoping comments received on the Polk Inlet Project, the internal scoping process, and comments received on the Draft EIS, eight broad issues were identified that were determined to be significant and within the scope of this EIS. These eight issue areas, Issues 1 through 8 below, represent concerns raised by the public, agencies, or the Forest Service. They were addressed through alternative development, and the environmental consequences of the action

alternatives have been analyzed in terms of these issues. Issues A-C represent issues considered but eliminated from detailed study because their resolution falls outside the scope of the Polk Inlet Project.

Issue 1: Wildlife Habitat

The Project Area provides important wildlife habitat and the wildlife supported are valuable for subsistence, recreational, aesthetic, economic, and ecological purposes. Of primary concern are the effects of timber harvest and associated road construction on species dependent on old-growth forest habitat. There is also concern regarding the proportion of Volume Classes 6 and 7 remaining after harvest in each management area. The long-term disposition of previously mapped old-growth areas (commonly referred to as retention and extended rotation) in the Project Area was identified as a part of this issue. Related to the overall concern is the question of whether timber harvest operations would further fragment existing large blocks of old-growth habitat and result in declines in biological diversity. The need for a project-specific old-growth retention strategy that ties into a larger scale retention strategy was also identified.

Issue 2: Fish Habitat and Water Quality

This issue addresses public concern for maintaining water quality in streams and nearshore marine waters which provide habitat for anadromous, resident, and marine fish. Streams and streamside habitat throughout the Project Area provide important shelter, food, spawning, and rearing areas for anadromous and resident fish. Crabs, shrimp, clams, mussels, and variousmarine fish are found in the estuaries and marine waters associated with the Project Area. Anadromous and resident fish are important to sport, commercial, and subsistence users throughout Southeast Alaska. In addition, the adjacent marine water and associated bottom environments provide habitat and food sources for both marine and anadromous fisheries.

Issue 3: Subsistence

Primary public concern is for the potential effects, as well as the cumulative effects, of timber harvest and road construction on the abundance and distribution of subsistence resources. For many residents of Prince of Wales Island, subsistence consists of hunting, fishing, trapping, and gathering to supplement their food sources, income, and other needs. For Southeast Alaska's Natives, it is a way of life directly related to preserving their culture and traditions. The Alaska Native Interest Lands Conservation Act (ANILCA) requires the Forest Service to determine if proposed activities may significantly restrict subsistence use. Other aspects of concern are competition from nonrural resource users and access to the resources.

Issue 4: Timber Economics and Supply

This issue encompasses public concern with the amount of timber available and proposed for harvest, methods of timber harvest, whether timber harvest should be continued, and balancing timber production with other Forest uses. It includes the issue of how the Project Area contributes to the long-term timber supply. It also includes concern for ensuring cost-effective timber harvest.

Issue 5: Visual Quality, Recreation, and Tourism

Public concern centers on the effect of timber harvest on the visual quality and area recreation values including sport hunting and fishing, guiding, and tourism. For a majority of visitors to Prince of Wales Island, the hillside, ridges, and valley surrounding Twelvemile Arm and flanking the Hollis-Klawock Highway are their first impression of the island. Cholmondeley Sound and other portions of the Project Area were chosen by many residents for their scenic beauty. These areas and large primitive and semiprimitive tracts provide natural settings that afford numerous recreation opportunities and scenic qualities specifically sought by residents and visitors to the area.

Issue 6: Social and Economic Factors

The key concern with this issue is what social and economic effects the proposed activities would have on communities in the Project Area—their stability and lifestyles—and on the resource-based industries such as commercial fishing, sport hunting and fishing, guiding, tourism, and timber upon which these communities depend. Also of concern are the effects on communities outside the Project Area which are partially dependent on the Tongass. Individuals, communities, and industries depend on the Tongass National Forest for their livelihood, lifestyle, and cultural preservation. The Forest provides natural resources for fishing, hunting, subsistence, timber harvesting, tourism, recreation, and mining. All are interrelated because what happens to one resource can affect another. Often these interests are in competition with one another. Conflict may also exist even within a particular resource area. Thus, social and economic factors are critical considerations in forest management.

Issue 7: Local Water Supplies

This issue reflects public concern that logging and associated activities could affect the quality of the domestic water supplies of the community of Hollis. Slopes that drain along the north side of the Hollis-Klawock Highway, the Maybeso Creek Watershed, and numerous unnamed streams on the west side of Twelvemile Arm currently supply portions of the drinking and domestic-use water for residents of Hollis.

Issue 8: Caves

Concern with this issue centers on how cave resources in the Project Area will be managed. Potentially significant cave resources occur on Prince of Wales Island, especially on the northern and northwestern parts of the island. The extent of Karst topography and cave resources in the Project Area is very limited.

Issues Outside the Scope of This EIS

Following is a list of items raised in scoping letters that fall outside the scope of this project-specific EIS. In some instances they are more appropriately addressed in the Forest Plan; in others they must be dealt with legislatively.

Issue A: Small Business Administration (SBA) Set-aside Program

The view was expressed that the SBA set-aside program should be limited to qualified small business. This is a national level management decision. Portions of the volume made available in any action alternative, especially from outside the Primary Sale Area, could be made available to the SBA set-aside program at the time it is sold.

Issue B: Tongass Road System

Comments regarding the issue of analyzing the benefits and drawbacks to extending the road system in the Tongass National Forest are considered a Forest Plan concern. This EIS addresses the effects, including cumulative effects, of extending the road system within the Polk Inlet Project Area.

Issue C: Opportunities for Fisheries, Soil Productivity, and Recreational Enhancement

Commenters said plans and projects should be funded now to enhance wildlife, fisheries, soil productivity, and recreational opportunities. Opportunities were identified both during field investigation and during consideration of action alternatives for the Polk Inlet Project to enhance these resources. The broader issue of funding enhancement of these opportunities is a forest-wide or regional decision. Projects eligible for KV funds will be identified.

Issue D: Below-cost Timber Sales

Below-cost timber sales are a national issue and not within the scope of this project-specific EIS. The decision on actual sale is a Forest management decision based on economic criteria at the time of sale.

Issue E: Recreational Opportunities on Prince of Wales Island

Some commenters asked for the promotion of recreational opportunities on Prince of Wales Island by business interests and private citizens. Although enhancement opportunities on National Forest System land within the Polk Inlet Project Area were identified through the EIS process, the broader issue of promoting recreational opportunities throughout Prince of Wales Island is beyond the scope of this EIS.

Issue F: 1992 Fish Protection Timing Window for Access Road Construction

KPC suggested that access roads be released for construction in 1992 so KPC would not have to shut down facilities due to delays in accessing available wood. Since this EIS was not released in draft form until 1993, this issue was clearly outside the scope of the EIS. Road construction timing limitations for fish protection were again evaluated for this EIS.

Legislation and Executive Orders Related to This EIS

Below is a brief list of laws and Executive Orders pertaining to timber harvest and the preparation of EIS's on Federal lands. Some of these laws are specific to Alaska, while others pertain to all Federal lands.

- Alaska National Interest Lands Conservation Act (ANILCA) of 1980
- Alaska Forest Resources and Practices Act of 1979 (as amended in 1991)

- Alaska Native Claims Settlement Act (ANCSA) of 1971
- American Indian Religious Freedom Act of 1978
- Archaeological Resources Protection Act of 1980
- Cave Resource Protection Act (1988)
- Clean Air Act of 1970 (as amended)
- Clean Water Act of 1977 (as amended)
- Coastal Zone Management Act of 1976
- Endangered Species Act of 1973
- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974
- Marine Mammal Protection Act of 1972
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- National Forest Management Act (NFMA) of 1976 (as amended)
- National Historic Preservation Act of 1966
- Native American Graves Protection and Repatriation Act of 1990 (P.L.101-601)
- Tongass Timber Reform Act (TTRA) of 1990
- Wild and Scenic Rivers Act of 1968, amended 1986
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 11593 (cultural)

Several other laws and legal documents deserve particular note because of their direct influence on the timber sale program:

- **TTRA**—the Tongass Timber Reform Act signed into law by President Bush on November 28, 1990, made certain unilateral changes in the KPC Long-term Contract to make it more consistent with independent National Forest timber sales programs. These changes include:

  - Ensure that all timber sale planning, management requirements, and environmental assessment procedures regarding the contracts are consistent with procedures for independent national forest timber sales;

  - Eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in Volume Classes 6 and 7 as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous management area does not exceed the proportion of volume currently represented by these classes within the management area;

  - Ensure that all timber offered under each contract will be substantially harvested within 3 years...unless harvesting has been delayed by third-party litigation;

  - Ensure that the price of timber offered under the contracts shall be adjusted to be comparable with that of independent national forest timber sales, with stumpage rates and profitability criteria comparable to those of independent purchasers in competitive sales;

  - Ensure that timber offered under the contract meets economic criteria consistent with that of independent national forest timber sales (Public Law 101 -626).

- **ANCSA**—the Alaska Native Claims Settlement Act, Public Law 92-203, 85 Stat. 688 (as amended), was enacted in 1971 to provide for the settlement of certain land claims of Alaska Natives. ANCSA has been the basis for conveying selected lands under administrative jurisdiction of the Tongass National Forest to Native corporations, thus making these lands

unavailable to the timber sale program. Under this Act, Native corporations have selected more than 550,000 acres from the Tongass National Forest, and more than 515,000 acres of the land have been conveyed to them.

- **ANILCA**—ANILCA, signed into law on December 2, 1980 (Public Law 96-487), established several areas to be preserved for the benefit, use, education, and inspiration of present and future generations. Title VIII of the Act addresses the use of public lands for subsistence—the customary and traditional uses by rural Alaska residents of wild, renewable resources. Because the Ketchikan Pulp Company timber sale contract area is located on federally managed lands, the requirements of Section 810 ANILCA must be satisfied prior to implementation of any timber harvest plan.

- **CZMA**—the Coastal Zone Management Act (CZMA) of 1976 also pertains to the preparation of EIS's. While Federal lands are excluded from the coastal zone as prescribed in the Act, the Act does require that when Federal agencies conduct activities that directly affect the coastal zone, those activities must be consistent to the maximum extent practicable with the approved State coastal management program. The Alaska coastal management program is contained in the Alaska Coastal Management Plan. This plan incorporated the Alaska Forest Resources and Practices Act of 1979 as amended (1991) as applied standards and guidelines for timber harvesting and processing. The Forest Service standards and guidelines and mitigation measures described in Chapter 2 of this document are fully consistent with the State coastal zone management standards. Field verification ensures that the activities proposed are consistent with the approved coastal management programs to the maximum extent practicable.

- **Prince of Wales Area Plan**—the Prince of Wales Area Plan proposes guidelines for how State-owned lands should be managed within the Prince of Wales planning area (ADNR 1988). The plan describes where the State proposes to select additional lands from the Tongass National Forest, prioritizes the location and timing of future land disposals, indicates where log transfer and storage areas may be located on State tide and submerged lands, and designates areas especially important for fish and wildlife habitat and harvest. It also sets guidelines for uses that occur on State lands. Area Plan guidelines likely to be applicable for units within the Project Area include the following: coordination and public notice, fish and wildlife habitat, float homes, forestry, public access, recreation, tourism, cultural and scenic resources, settlement, shoreline development, and subsurface resources.

Federal and State Permits and Licenses

To proceed with the timber harvest as addressed in this Final EIS, various permits must be obtained from other government agencies. The agencies and their responsibilities are listed below.

- U.S. Army Corps of Engineers
  Approval of discharge of dredged or fill material into waters of the United States (Section 404 of the Clean Water Act).
  Approval of construction of structures or work in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899).

- U.S. Environmental Protection Agency
  Storm water discharge permit.
  National Pollutant Discharge Elimination System review (Section 402 of the Clean Water Act).

- State of Alaska, Department of Natural Resources
  Authorization for occupancy and use of tidelands and submerged lands.

- State of Alaska, Department of Environmental Conservation
  Certification of compliance with Alaska Water Quality Standards (Section 401 Certification).
  Solid Waste Disposal Permit (Section 402 of the Clean Water Act).

- U.S. Coast Guard
  Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946) required for all structures constructed within the tidal influence zone.

Availability of Planning Record

The Planning Record is a comprehensive project file documenting the process of developing this EIS. The complete Planning Record is available by request under the Freedom of Information Act (FOIA) at the Forest Supervisor's office, Ketchikan, Alaska. The reader also may want to refer to the Tongass Land Management Plan (TLMP 1979a, as amended), the TLMP Draft Revision (1991a), the Tongass Timber Reform Act, the Resource Planning Act, the Alaska Regional Guide and its Final EIS, ANILCA, or ANCSA. These are available at public libraries around the region as well as at the Supervisor's Office in Ketchikan.

Chapter 2

Alternatives

Chapter 2

Alternatives

Key Terms

Alternative—one of several policies, plans, or projects proposed for decision-making.
BMP's—Best Management Practices - practices used for the protection of water quality.
Desired future condition—a concise statement that describes a desired condition to be achieved sometime in the future. The TLMP Draft Revision (1991a) describes a desired future condition for each LUD. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed.
Implementation monitoring—collecting information to evaluate whether mitigation measures were carried out in the manner called for.
Mid-market—an economic estimate of timber value at a point in time when half of the timber was harvested at a higher value and half was harvested at a lower value.
Mitigation—measures designed to counteract or lessen environmental impacts.
MMBF—a million board feet.
Partial cut—harvest of timber using silvicultural prescription other than clearcut; examples include shelterwood, seed tree, and group selection.
Subsistence—the customary and traditional uses by rural Alaskan residents of wild renewable resources for direct personal or family consumption.

Introduction

This chapter describes and compares the alternatives considered by the Forest Service for the Polk Inlet Project. The first section describes the process followed to formulate the alternatives. This section is followed by descriptions of the alternatives considered but eliminated from detailed study, and the alternatives considered in detail. A comparison of the alternatives, including how each alternative addresses the significant issues, follows these sections. The last two sections describe site-specific mitigation measures and the monitoring plan proposed for the project.

Changes between DEIS and FEIS

Refinement of Information

There has been a refinement in the site-specific information available for analysis in the Final EIS compared to what was available at the time the Draft EIS was published. Refined information has been incorporated into the Final EIS in order to make the proposed harvest units more site-specific, as well as to make the units selected for each alternative more closely align with the alternative theme. The unit cards in Appendix E display the unit configuration, layout direction, and mitigation measures that apply to each unit and have been revised to reflect the changes made to them based on refined information. Much of this information is also summarized in Appendix B.

There are three general sources of improved information:

- Additional Forest Service field reconnaissance of some harvest units and goshawk surveys

- Public responses to the Draft EIS

- Subsistence hearings in seven local communities

Improved Analysis

In addition to incorporating this refined information, the Final EIS strengthened and expanded many of the analyses based on public comments. The resource analysis represents an improvement over what was presented in the Draft EIS. Some of the more significant revisions are as follows:

- In response to increasing concerns over the maintenance of well distributed, viable populations of wildlife, two habitat conservation strategies were developed for the Project Area and the effects of the alternatives on these strategies are analyzed.

- Wildlife habitat capability models for Management Indicator Species are implemented incorporating patch size effectiveness indexes and road density indexes to more closely correspond with all details of the models.

- A Biological Assessment/Biological Evaluation for threatened, endangered, and sensitive species of plants and animals is included as Appendix J.

- Subsistence analysis considers the effect of increased hunter and trapper demand over time.

- Harvest and habitat capability for each complete Wildlife Analysis Area (WAA) is analyzed in the subsistence section rather than only the portions of each WAA inside the Project Area.

Development and Refinement of Alternatives

Each alternative presented in this Environmental Impact Statement (EIS) represents a different response to the issues discussed in Chapter 1. Four action alternatives were developed that meet the stated purpose and need of the project. Each action alternative consists of a site-specific proposal developed through intensive interdisciplinary timber harvest unit and

road design based on ground verification of all units and roads considered, along with 1991 color aerial photos, topographic maps, and a large quantity of available resource data in Geographical Information System (GIS) format.

Scoping for the Polk Inlet Project began in August 1991. The Interdisciplinary (ID) Team reviewed and analyzed the issues developed during scoping and identified the significant issues described in Chapter 1. Options for addressing the issues were discussed and areas of overlap among methods of addressing issues were examined by the ID Team. Issues identified as significant were categorized according to whether they: (1) are dealt with by land use allocations at the Forest Plan level; (2) will be addressed through implementation of standards and guidelines defined by the Forest Plan; (3) can be addressed through project-specific mitigation measures; (4) can be addressed through unit allocation under all or most alternatives; (5) should be used to drive or partially drive an alternative; or (6) are beyond the scope of this EIS. The issues placed in categories 4 and 5 were the primary factors considered by the ID Team in the development of the frameworks for the action alternatives.

Concurrent with scoping and the ID Team review of scoping issues, logging and transportation engineers and resource specialists from the ID Team developed a detailed Logging System and Transportation Plan that was specific to the Polk Inlet Project Area and consistent with the Tongass Land Management Plan (TLMP) Revision Supplement to the Draft EIS (TLMP Draft Revision 1991a). This plan was based on previous logging and transportation system plans available for portions of the Project Area, updated topographic maps, 1991 aerial photos, and the available GIS data. In developing the plan, the ID Team identified harvest unit boundaries for all suitable and available commercial forest land in the Project Area, including those areas accessible only by helicopter, and identified the road system required to access these lands. The ID Team then conducted an intensive review of the Logging System and Transportation Plan and identified how much area could be harvested at this time consistent with Forest Plan standards and guidelines. The major factors limiting the number of potential harvest units available for allocation were: (1) adjacency; (2) cumulative visual disturbance; and (3) cumulative watershed effects. Based on this review, 192 harvest units and associated roads, representing one possible configuration, were identified.

These 192 harvest units represented the pool of units available for allocation to the action alternatives. Available aerial photos, topographic maps, and GIS plots and data for each of these units were reviewed and each unit was ground-verified by a team of specialists during summer 1992. Ground verification included preliminary flagging of unit boundaries, including buffers, and observations regarding watershed, soils, caves, fish and wildlife habitat and presence, and visual, recreation, and cultural resources. Preliminary road routes were also examined for feasibility and flagged by road locators. Based on ground verification, 32 units were deferred or eliminated from consideration during this study for a variety of reasons. These reasons included very high mass movement soils, stands having less than 8,000 board feet (MBF) of timber volume per acre, cumulative watershed disturbance, cumulative visual disturbance, adjacency and other factors. Many of these units would be available in future entries. In addition, the boundaries of most units were modified (generally the units were made smaller) and the locations of most roads were changed based on what was observed on the ground. The resulting pool of units was reduced from 192 to 160 units. Appendix B provides a summary of the characteristics of these harvest units. Unit and road design cards are provided in Appendices E and F. A sample of the integrated silvicultural prescriptions developed for each harvest unit is provided for one unit in Appendix G.

The ID team reviewed the ground-verified pool of units and allocated them to the alternative frameworks. Six alternatives, including four action alternatives, were then analyzed in the Draft EIS.

2 Alternatives

Comments on the Draft EIS were received from approximately 45 individuals, organizations, and agencies. Approximately 370 form letters with additional comments were also received. Subsistence hearings and open house meetings were held in seven local communities to receive public input on how the project would affect subsistence and other activities. These forms of public input were evaluated and considered heavily in the refinement of the alternatives.

Improved information obtained after the Draft EIS and public input were first used to make site-specific changes to individual harvest units. Then the allocation of units to the alternatives was refined. Alternatives 2 and 5 of the Draft EIS were substantially modified; therefore, they are referred to as Alternatives F2 and F5, respectively, in the Final EIS. Alternatives 3 and 4 were not modified except for site-specific changes to individual harvest units; therefore, they continue to be referred to as Alternatives 3 and 4 in the Final EIS.

Items Common to All Alternatives

Items common to the frameworks of all alternatives are identified below.

- Each action alternative considered for detailed study meets the stated purpose and need of the project as closely as possible. The stated purpose and need is to make approximately 125 million board feet (MMBF) of timber available from the Polk Inlet Project Area to the Ketchikan Pulp Company (KPC) as part of the Long-term Contract, or to the Ketchikan Area Independent Sale Program, in a manner that is consistent with the Forest Plan management direction/emphasis and the desired future condition of the TLMP Draft Revision (1991a).

- Each alternative complies with such Forest Service planning documents as the 1990 Resources Planning Act, the Alaska Regional Guide, the TLMP as amended (1979a), and the intent of the TLMP Draft Revision (1991a).

- Each alternative complies with Sec. 301(c)(2) of the Tongass Timber Reform Act (TTRA), which states that the Forest Service shall:

  > . . . eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the harvest over the rotation in volume classes 6 and 7, as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous management area does not exceed the proportion of volume currently represented by these classes within the management area.

  Each alternative meets this legal requirement for both Management Area (MA) K17 and K18 in the Polk Inlet Project Area.

- Each alternative complies with Sec. 103(e) of TTRA which states the Forest Service shall:

  > . . . maintain a buffer zone of no less than 100 feet in width on each side of all Class I streams in the Tongass National Forest, and on those Class II streams which flow directly into Class I streams, within which commercial timber harvesting shall be prohibited....

- Each alternative is consistent with the standards, guidelines, and land allocations of TLMP (1979a, as amended) and the TLMP Draft Revision (1991a).

- Each alternative is consistent with the standards and guidelines of Alternative P of the TLMP Draft Revision (1991a):

- Preliminary analysis indicates that each individual unit proposed for harvest by any of the action alternatives meets the TLMP Draft Revision (Alternative P) standards and guidelines for riparian management.

- No timber will be harvested within either the 500-foot shoreline buffer or the 1,000-foot estuarine buffer.

- Collectively, all units meet the TLMP Draft Revision (Alternative P) objective to provide sufficient wildlife habitat to contribute to the maintenance of viable populations of wildlife species.

- All units and roads will meet the visual quality objectives (VQO's) proposed under the TLMP Draft Revision (Alternative P).

- Individual harvest units that exceed 100 acres comply with current regional direction in the Alaska Regional Guide which states that:

  One-hundred acres is the maximum size of created openings to be allowed for the hemlock-Sitka spruce forest type of coastal Alaska, unless excepted under specific conditions. Recognizing that harvest units must be designed to accomplish management goals, created openings may be larger where larger units will produce a more desirable contribution of benefits.

  This statement is designed to comply with legal limitations imposed on the maximum size of created openings as specified by the National Forest Management Act of 1976 (NFMA). The specific conditions listed in the Alaska Regional Guide include considerations for topography, condition of adjacent openings, effect on water quality or quantity, effects on wildlife and fish habitat, regeneration requirements, transportation, economic considerations, and harvest system requirements. Also addressed are natural and biological hazards such as windthrow, insect or disease problems, and visual absorption capacity. Any unit or combination of units larger than 150 acres for this project requires approval of the Regional Forester. Only 5 units exceed 100 acres and no units exceed 150 acres in the action alternatives.

- Ecosystem management opportunities were considered and are incorporated into all alternatives. These opportunities are available both at the landscape level (e.g., a Value Comparison Unit [VCU], watershed, or viewshed) and at the stand level (e.g., individual harvest unit). Some of the opportunities that are responsive include:

  Landscape level
  - maintaining large, unfragmented blocks of old-growth forest
  - minimizing the amount of edge by designing larger harvest units
  - using beach and estuary fringe and stream buffers as corridors between old-growth blocks

  Stand level
  - retaining snags in harvest units (where safety regulations allow)
  - retaining individual live reserve trees or small patches of live reserve trees in clearcuts
  - using selection harvest systems for maintenance of visual quality and wildlife habitat
  - using shelterwood harvest to maintain the cedar component
  - maintaining large down logs in harvest units
  - using silvicultural treatment of second growth to enhance wildlife habitat

- No alternative proposes to harvest timber in the Maybeso Experimental Forest (VCU 610) or in the Old Tom Creek Research Natural Area (located in VCU 618).

- No alternative proposes to harvest timber along the Hollis-Klawock Highway in VCU 622. Given the proposed VQO for this area and its status as a Sensitivity Level I travel route (see *Visual Resources* section of Chapter 3), cumulative visual disturbance due to extensive logging in the 1960's was determined to be too high to allow additional logging activity during this entry.

- No alternative proposes to harvest timber along Twentymile Creek in VCU 622. Because of the cumulative harvest in this area following implementation of the 1989-94 EIS, all units were deferred because of adjacency, cumulative visual disturbance, or wildlife habitat values.

Clearcut

- No alternative proposes to harvest timber in the area northeast of Hollis in VCU 611, which was given a Scenic Viewshed Land Use Designation (LUD) under Alternative P of the TLMP Draft Revision (1991a). Because of the proposed VQO for this area, its Sensitivity Level I status (see *Visual Resources* section of Chapter 3), and its low visual absorption capacity, only selective logging or very small clearcuts and limited or no road construction would be permitted under the Forest Plan. For these reasons and because visual concerns derived from scoping comments relative to this area were high, harvest in this area was deferred until future entries.

- No alternative proposes to harvest timber near the southwest end of Twelvemile Arm in VCU 621. Given the proposed VQO for this area and the Sensitivity Level I status of the recreation site located here (see *Visual Resources* section of Chapter 3), cumulative visual disturbance caused by logging since the early 1960's was determined to be too high to allow additional logging during this entry.

- No alternative proposes to harvest timber in the Beaver Creek watershed in VCU 621 due to recent high cumulative watershed harvest levels, including Native corporation lands.

- No alternative proposes to harvest timber in the Big Creek area, the Sulzer Portage area, or along the West Arm of Cholmondeley Sound west of Cannery Creek in VCU 674. Most of the commercial forest land in these areas is currently encumbered, having been selected by Native corporations. It is reasonably foreseeable that most of this land would be logged following transfer of ownership in the near future. Native lands to the east along the South Arm of Cholmondeley Sound and Dora Bay have been heavily logged. The remaining National Forest System land in this VCU was designated as LUD III under TLMP and was proposed as a Modified Landscape LUD under Alternative P of the TLMP Draft Revision (1991a). The lands on the south side of the West Arm and along Big Creek also have very high wildlife and fish habitat values. Given the potential cumulative effects on visual and wildlife resources associated with past and reasonably foreseeable logging in this area, entry was deferred into areas outside of the Cannery Creek drainage.

Alternatives Considered but Eliminated from Detailed Study

Alternative A

This alternative equates to the harvest unit pool. It responds to the issue of how much timber is available in the Project Area during this entry. This alternative resulted in 160 harvest units on 6,600 acres providing 177 MMBF of net sawlog plus utility volume. This volume included approximately 8 MMBF from road right-of-way (ROW) clearing. It required 78 miles of road to access the harvest units. It was not considered in detail because it exceeded the stated purpose and need by 52 MMBF.

Alternative B

Several public and agency comments requested that the Forest Service analyze a reduced harvest within the Polk Inlet Project Area. No specific harvest volume, however, was proposed. Because of the defined purpose and need of the project, a lower volume alternative was not considered in detail. More information on why lower volumes were not considered is included in Appendix A.

Alternative C

Several public comments requested the Forest Service to analyze an alternative that would keep intact all previously mapped old-growth retention and extended rotation areas during this entry. Under the TLMP Draft Revision standards and guidelines, old-growth habitat will remain unaltered in beach, estuary, and TTRA buffers, research natural areas, and LUD I and LUD II areas, as well as in unsuitable commercial forest land. Previously mapped old-growth retention and extended rotation areas are consequently considered as part of the tentatively suitable and available timber base, unless otherwise excluded. The ID Team analyzed this alternative to the extent of determining that the maximum volume that could be achieved was approximately 102 MMBF from 3,869 acres in 98 harvest units. This volume included approximately 6 MMBF from ROW clearing. It required 57 miles of road to access the harvest units. Because of the defined purpose and need of the project, this alternative was not considered in detail in the Draft EIS.

Even though the volume of Alternative C is in the range of Alternatives F2 and F5 for the Final EIS, the ID Team believed that the old-growth retention strategies developed for Alternatives F2 and F5 goes beyond the retention provided by previously mapped old growth, does a better job of preserving larger blocks of old growth, and is more consistent with current conservation biology theory. Therefore, Alternative C was not considered in detail in the Final EIS. The effects of the alternatives on previously mapped old-growth areas are considered in Chapter 4.

Alternatives Considered in Detail

Six alternatives are considered in detail. Alternative 1 would not implement any action alternatives; the Polk Inlet Project Area would remain subject to natural changes only, after all 1989-94 EIS units have been harvested. This alternative represents the existing condition with which all other alternatives are compared. Alternative 1a is a variation of Alternative 1; it would cause the Project Area to remain subject to natural changes only, after partial implementation of the 1989-94 EIS. Alternatives F2, 3, 4, and F5 represent different means of satisfying the purpose and need for timber harvest while responding with different emphasis to the various issues. Implementation of these action alternatives would be additional to the full implementation of the 1989-94 EIS.

Foldout color maps of all alternatives considered in detail are provided at the end of Chapter 2. Large-scale maps of these alternatives are available in the Project Planning Record.

Alternative 1 (No Action)

Framework—Alternative 1, also called the No-Action Alternative, would result in no timber harvest or road construction in the Polk Inlet Project Area that is additional to the timber harvest cleared by the 1989-94 EIS. It does not preclude harvest of units analyzed under the 1989-94 EIS but not yet felled as of the Polk Inlet Record of Decision (ROD). Under this alternative, replacement timber volume would probably not be available from somewhere else within the Ketchikan Area at this time. This alternative serves as a baseline against which to measure the effects of the action alternatives and Alternative 1a.

Resource Outputs—There are no new timber harvest outputs associated with this alternative. Timber harvest and road and log transfer facility (LTF) construction would halt in late 1994 following full implementation of the 1989-94 EIS.

Economic Outputs—Because Alternative 1 would result in no new timber harvest or road construction beyond that which is already approved, there would be no timber-related economic outputs. Additional receipts to the State of Alaska would be foregone and no new timber jobs would be created.

Environmental Consequences—A summary of the environmental consequences of implementing Alternative 1 by significant issue is presented below. The effects described are additional to those occurring as a result of implementation of the 1989-94 EIS.

Issue 1: Wildlife Habitat

- All effects on habitat would be avoided resulting in no change from existing conditions except for those changes resulting from natural factors such as plant succession.

- TTRA proportionality (proportion of Volume Class 6 and 7 remaining in each MA) would be 0.61 percent less than the TTRA baseline for MA K17 and 0.81 percent less than the baseline for K18.

Issue 2: Fish Habitat and Water Quality

- No effects on fish habitat or water quality are expected other than those caused by two factors independent of the Polk Inlet Project. First, there would be continued slight degradation of fish habitat resulting from lack of large woody debris recruitment caused by past timber harvesting to the stream bank. Second, fish habitat enhancement projects are expected to result in increased fish habitat capability, especially in the Old Franks Creek drainage.

Issue 3: Subsistence

- Subsistence use of the Project Area would not be affected under Alternative 1. No timber harvest or road construction would occur in the 43,396 cumulative acres of subsistence use areas in the Project Area used by 10 percent or more of a rural community's households for deer hunting.

- A significant possibility of a significant restriction of subsistence use of black bear and marten would occur in some areas.

Issue 4: Timber Economics and Supply

- Alternative 1 would result in no timber-related economic outputs and therefore would not provide any direct return to the U.S. Treasury. The current timber supply in the Polk Inlet Project Area would be unaffected.

Issue 5: Visual Quality, Recreation, and Tourism

- Under Alternative 1, visual quality and recreation and tourism opportunities would remain unchanged in the Project Area.

Issue 6: Social and Economic Factors

- No economic return to the State of Alaska due to timber harvest would occur.

- No timber jobs would be created in the Polk Inlet Project Area after 1994, until another timber project is evaluated and implemented.

- Lack of timber harvest activity in the Project Area would likely result in the shutdown of the Polk Inlet logging camp and economic impacts on its residents after 1994. Economic impacts would, at least temporarily, occur to some residents of Craig, Klawock, Hollis, Hydaburg, and Ketchikan who depend directly or indirectly on timber harvesting in the Project Area.

Issue 7: Local Water Supplies

- Alternative 1 would have no effect on local water supplies.

Issue 8: Cave Resources

- Alternative 1 would have no effect on the cave resources of the Project Area.

Alternative 1a (No Action/No Harvest)

Framework—The framework for this alternative is to propose no timber harvest from the Polk Inlet Project Area effective on the date of the Polk Inlet Record of Decision (ROD). It precludes the harvest of units analyzed under previous NEPA documents but not yet felled as of the ROD date. This affects an estimated 52 of the 95 harvest units scheduled for harvest in the Polk Inlet Project Area under the 1989-94 EIS. This alternative serves as an additional benchmark against which to measure the effects of other alternatives.

Resource Outputs—There are no new timber harvest outputs associated with this alternative; rather, there is a reduction in timber harvest-related outputs relative to Alternative 1. Alternative 1a would eliminate the harvest of 52 units totaling approximately 2,587 acres and 75 MMBF. Alternative 1a would also eliminate the need for construction of about 35 miles of new roads and the development of three LTF's—two at McKenzie Inlet and one near Little Coal Bay.

Economic Outputs—Alternative 1a would stop timber harvesting in the Project Area as of the date of the Polk Inlet ROD. Therefore, receipts to the State of Alaska and the number of timber jobs created would be reduced relative to Alternative 1.

Environmental Consequences—A summary of the environmental consequences of implementing Alternative 1a by significant issue is presented below. The effects described are relative to the baseline, which is represented by Alternative 1.

Issue 1: Wildlife Habitat

- The major effect would be the avoidance of harvesting 2,587 acres of wildlife habitat. This includes about 2,150 acres mapped as old-growth forest habitat (Volume Classes 4 to 7) resulting in an increase of 3 percent in the remaining old growth, relative to Alternative 1.
- TTRA proportionality would be 0.03 percent higher than the baseline for MA K17 and 0.99 percent lower than the baseline for MA K18.
- The 35 miles of fewer roads would reduce access into presently unroaded areas. The 3 LTF's and 1 logging camp that would not have to be developed would reduce habitat and disturbance impacts from these sources.
- All entry into the Indian Creek drainage would be avoided. Other currently unentered areas that would be maintained in a natural condition relative to Alternative 1 are the McKenzie Inlet area and the Little Coal Bay area.
- The area in unfragmented old-growth patches greater than 10,000 acres in size would increase by 807 acres; the area in patches greater than 5,000 acres would increase by 891 acres.
- Sitka black-tailed deer habitat capability would be increased by 2 percent and the amount of unharvested medium to high quality winter range would be increased by 3 percent.
- Increases in habitat capability for all wildlife Management Indicator Species (MIS) would range from 0 to 3.9 percent.

Issue 2: Fish Habitat and Water Quality

- No measurable improvements to fish habitat or water quality are expected because of the implementation of TTRA buffers, additional-width buffers, Best Management Practices (BMP's) and other mitigation measures, in harvest areas to be avoided.

- Potential risk to water quality and fish habitat would be reduced due to avoiding harvest of 2,587 acres and construction of 35 miles of road.

- Potential benefits to marine habitats and organisms would occur due to elimination of the need for three new LTF's and one new floating logging camp.

Issue 3: Subsistence

- About 624 acres used by more than 10 percent of rural community households for deer hunting would not be harvested relative to Alternative 1.

- Based on the wildlife analysis and existing harvest levels, deer habitat capability would be increased relative to Alternative 1 and would be well above that needed to support the deer population needed to support current harvest levels.

- A significant possibility of a significant restriction of subsistence use of black bear and marten would occur in some areas.

Issue 4: Timber Economics and Supply

- Alternative 1a would result in reduced economic outputs and returns to the U.S. Treasury relative to Alternative 1.

- Under Alternative 1a, the current timber supply in the Polk Inlet Project Area would be increased by about 75 MMBF.

Issue 5: Visual Quality, Recreation, and Tourism

- Visual quality would remain generally unchanged in the sensitive viewsheds of the Project Area.

- Visual quality would be enhanced in McKenzie Inlet, relative to Alternative 1, because timber harvest and road and LTF construction, scheduled to occur under the 1989-94 EIS, would not be implemented. This could have a positive effect on outfitter and resort opportunities in the area.

- Visual quality would also be improved in other viewsheds with lower visual sensitivity such as the Twentymile drainage, Indian Creek, and the Little Coal Bay area.

- Stopping timber harvest and road construction on the date of the Polk Inlet ROD would prevent the change of approximately 12,100 acres from unroaded to roaded Recreation Opportunity Spectrum (ROS) settings relative to Alternative 1.

Issue 6: Social and Economic Factors

- Economic returns to the State of Alaska due to timber harvesting in the Project Area would be reduced relative to Alternative 1.

- No timber jobs would be created in the Polk Inlet Project Area after 1994.

- Lack of timber harvest activity in the Project Area would likely result in the shutdown of the Polk Inlet logging camp and community and economic impacts on its residents after 1994. Economic impacts would, at least temporarily, occur to some residents of Craig, Klawock, Hollis, Hydaburg, and Ketchikan who depend directly or indirectly on timber harvesting in the Project Area.

Issue 7: Local Water Supplies

- Alternative 1a would have no effect on local water supplies.

Issue 8: Cave Resources

- Alternative 1a would have no effect on cave resources of the Project Area.

Alternative F2

Framework—The framework for Alternative F2 consists of implementing the Forest Plan by identifying logical harvest unit groupings and taking most available harvest units within these groupings consistent with standards and guidelines, giving consideration to specific scoping issues. Emphasis was placed on Management Area K17, which is in the KPC Primary Sale Area. Consideration was given to all significant scoping issues to the degree possible while producing a volume close to 125 MMBF. Scoping issues considered in the selection of units included: wildlife habitat (Issue 1); water quality (Issue 2); subsistence (Issue 3); timber economics (Issue 4); and visual quality, recreation, and tourism (Issue 5). The wildlife habitat issue, specifically the effects of the project on old-growth habitats, was addressed by avoiding harvest in large unfragmented areas of old growth. An old-growth retention strategy was developed for this alternative that fits ongoing forest-wide planning efforts to maintain well-distributed viable wildlife populations. The water quality issue was addressed by avoiding harvest and road construction in the Fubar Creek watershed. The subsistence issue was addressed by focusing on the wildlife issue and by limiting harvest activities along Twelvemile Arm, Indian Creek, and in the vicinity of Hollis. The visual quality, recreation, and tourism issue was also addressed by limiting harvest activities along Twelvemile Arm, the Hydaburg Road, and the vicinity of Hollis.

Resource Outputs—Implementation of Alternative F2 would result in the harvest of 3,951 acres in 88 harvest units producing approximately 108 MMBF of net sawlog and utility volume. This volume includes approximately 5 MMBF from road right-of-way (ROW) clearing. Average unit size would be about 45 acres and 4 units would exceed 100 acres. Of this harvest, 420 acres are planned for partial cut; the remainder are planned for clearcut harvest. The retention of reserve trees is planned to varying degrees in all units proposed for clearcutting. Alternative F2 schedules 1,108 acres in 27 units for helicopter yarding; the remainder would be yarded by conventional methods. To implement this harvest, approximately 42 miles of new road would be constructed.

No new LTF's would be needed. Timber harvested would be hauled to existing LTF's on Twelvemile Arm and Polk Inlet and to the LTF already scheduled for development near Little

Coal Bay. The existing logging camp at Polk Inlet is all that would be required to support the harvest of approximately 98 MMBF. Harvest of the remaining 10 MMBF would require the support of a floating camp near Little Coal Bay; this camp would be developed during the 1989-94 Operating Period, prior to implementation of the Polk Inlet Project.

Economic Outputs—Preliminary economic analysis indicates that Alternative F2 would produce an overall net mid-market stumpage value in the range of $27.33 to $39.53 per thousand board feet (MBF), depending on the cost method used. The two cost methods are based on different methods of estimating helicopter logging costs. The present net value (PNV) of Alternative F2 was estimated to be in the range of -$1.29 million to $0.02 million. Payments to the State of Alaska resulting from Alternative F2 were estimated at $2.33 million. Average annual direct jobs created were estimated at 206 over 4 years.

Environmental Consequences—A summary of the environmental consequences of implementing Alternative F2 by significant issue is presented below.

Issue 1: Wildlife Habitat

- The major effect would be the harvest of 3,951 acres (including roads) of wildlife habitats. This includes 3,386 acres of old-growth forest habitat (Volume Classes 4 to 7) or about 5 percent of the total remaining old growth.

- TTRA proportionality would be 0.44 percent less than the baseline for MA K17 and 0.07 percent lower than the baseline for MA K18. The 42 miles of road construction/reconstruction would provide new access into unroaded areas. Because no new LTF's or logging camps would be required, habitat and disturbance impacts from these sources would be avoided.

- Approximately 230 acres of habitats in the high-value Indian Creek drainage would be harvested. Impacts to high-value habits around Cholmondeley Sound would be avoided.

- This alternative would incorporate the old-growth retention strategy (referred to as Retention Strategy A) shown in Figure 2-1. Most of the changes between Alternative 2 in the Draft EIS and Alternative F2 were designed to make Alternative F2 consistent with Retention Strategy A. This retention strategy includes 52,601 acres of habitat conservation areas (HCA's), including three medium and four small HCA's, and 16,336 acres of corridors. The HCA's include 24,241 acres of old-growth forest, which would serve as retention. Alternative F2 includes no harvest units within the HCA's or corridors of Retention Strategy A.

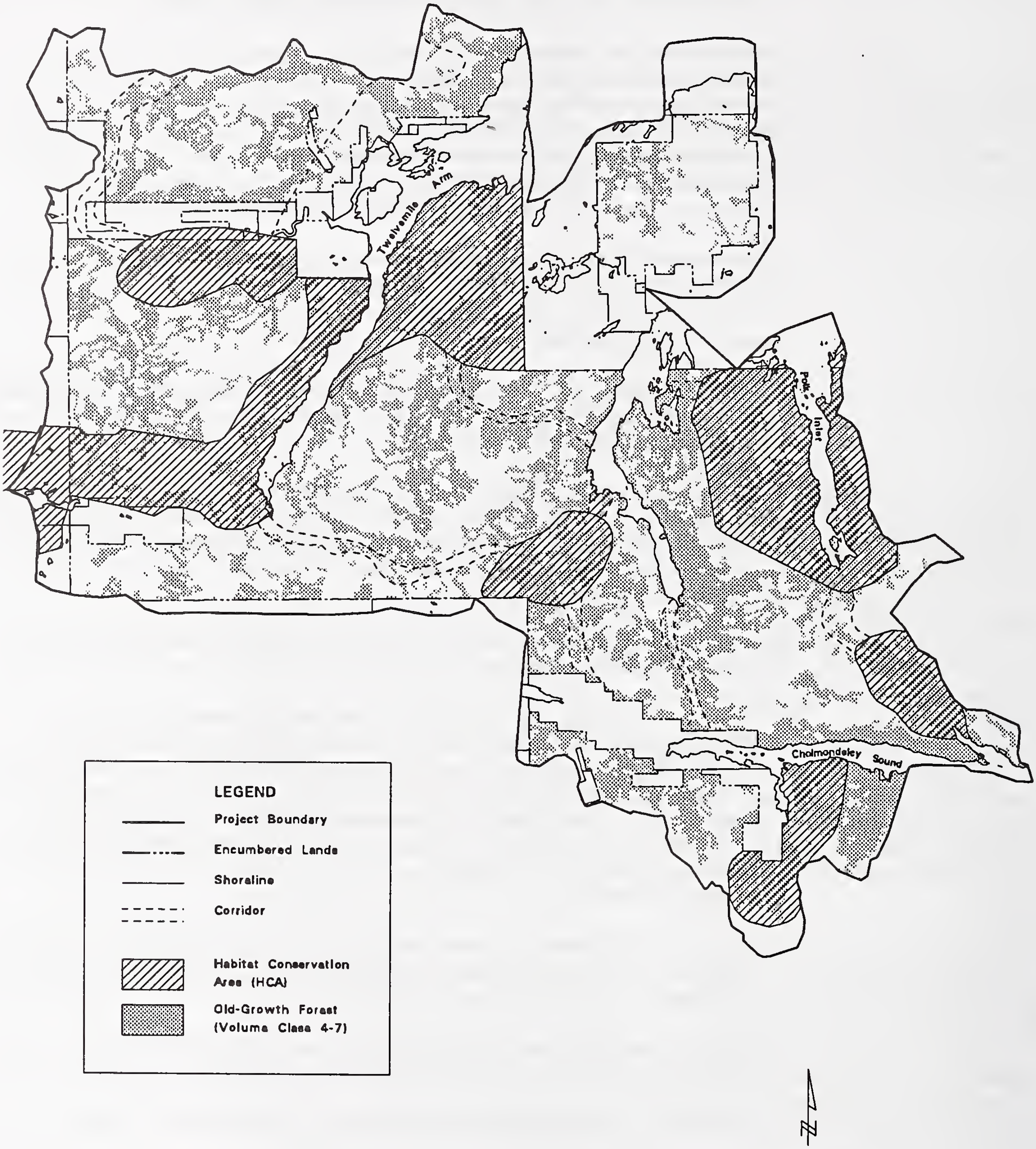
- The area in unfragmented old-growth patches greater than 10,000 acres in size would be reduced by 11,485 acres; the area in patches greater than 5,000 acres would be reduced by 2,018 acres.

- Sitka black-tailed deer habitat capability would be reduced by 3.5 percent and 4.6 percent of all medium to high quality winter range would be harvested.

- Reductions in habitat capability for all MIS would range from 0 to 5.7 percent.

- Threatened or endangered species would not be affected.

Figure 2-1
Old-growth Retention Strategy A



Issue 2: Fish Habitat and Water Quality

- No measurable effects on fish habitat or water quality are expected due to implementation of TTRA buffers, additional-width buffers, BMP's, and other mitigation measures.

- No harvest units or roads would be developed in the watershed of Fubar Creek, which is on the State of Alaska impaired water body list.

- Cumulative watershed harvest thresholds would not be exceeded for any major watershed.

- Measures of potential risk to water quality and fish habitat are as follows: (1) a soil disturbance index of 700 acres was estimated due to timber harvest and road construction; (2) 1,826 acres of high hazard soils and 0 acres of very high hazard soils would be harvested; and (3) 411 acres of riparian area (primarily around lakes and along Class III streams) would be harvested outside of no-cut buffers. Additionally, roads would cross 3 Class I, 10 Class II, and 88 Class III streams, and streamside vegetation would be removed along 18 miles of Class III streams and at stream road crossings.

Issue 3: Subsistence

- About 405 acres used by more than 10 percent of rural community households for deer hunting would be harvested.

- Based on the wildlife analysis and projected harvest levels, deer habitat capability would be well above that needed to support the deer population needed to support current harvest levels. However, a significant restriction of subsistence deer hunting may occur prior to 2054 if scheduled timber harvesting occurs.

- A significant possibility of a significant restriction of subsistence use of black bear and marten would occur in some areas.

Issue 4: Timber Economics and Supply

- Preliminary economic analysis indicated an overall net mid-market stumpage value in the range of $27.33/MBF to $39.53/MBF. The PNV's associated with these stumpage values would range from -$1.29 million to $0.02 million. Negative PNV's are not uncommon for initial entry sales, which is what this alternative primarily represents. Future entries to harvest the remaining old growth, would be more positive, since the basic road system would be in place.

- After implementation of Alternative F2, 1,542 acres or 53 percent of the remaining acreage from the current unit pool would be available for cable yarding in the next entry—the rest would require helicopter yarding.

- Timber supply analysis indicates that, given certain conditions, sufficient timber would be available both within the Polk Inlet Project Area and on Prince of Wales Island as a whole to support scheduled timber harvest through the end of the first rotation (Year 2054) when second growth would become widely available for harvest. However, this conclusion depends on timber values increasing and/or improved or more efficient logging systems being developed to make economically marginal harvest units more attractive. It also depends on the assumption that no new land use allocations are made in the future that would reduce the timber base.

Issue 5: Visual Quality, Recreation and Tourism

- Changes in the visual quality of the sensitive area along the Alaska Ferry Route and near the community of Hollis would not occur. The only change that would occur within the viewing corridor along the Hollis-Klawock Highway would be at the junction with the Hydaburg Road.

- Effects on the visual quality inside Twelvemile Arm would be low to moderate, due to harvest east of the middle part of the Arm. Harvest activities would not be visible from future recreation sites at the head of the Arm.

- No harvest would occur to change the visual quality in the Cholmondeley Sound area.

- Timber harvest would have minimal effects on existing and potential recreation sites.

- Timber harvest and road construction would result in a change of approximately 22,800 acres from unroaded to roaded Recreation Opportunity Spectrum (ROS) settings.

Issue 6: Social and Economic Factors

- Payments to the State of Alaska (under the National Forest Receipts Act) resulting from this alternative were estimated at $2.3 million based on preliminary economic analysis.

- About 206 annual direct jobs would be created over 4 years.

- Timber harvest and road construction would have minimal effects on the resource-based lifestyles of communities in and near the Project Area.

Issue 7: Local Water Supplies

- Timber harvest and road construction would have no effect on local water supplies in the Project Area.

Issue 8: Caves

- One harvest unit in this alternative was identified during field surveys as having potentially significant cave resources. Identified mitigation measures would be implemented to avoid effects to these caves unless further field surveys and analysis determine that they are not significant resources.

Alternative 3

Framework—The framework for Alternative 3 emphasizes limiting harvest to Management Area (MA) K17. It provides for the harvest of all available timber in MA K17 and includes only enough units in MA K18 to bring the volume up to approximately 125 MMBF. The harvest units in MA K18 are arranged in logical groupings and emphasize geographic areas not included in other alternatives.

Resource Outputs—If Alternative 3 were implemented, it would result in the harvest of 4,711 acres in 113 harvest units producing approximately 119 MMBF of net sawlog and utility volume. This volume includes approximately 7 MMBF from road ROW clearing. Average unit size would be about 42 acres and 4 units would exceed 100 acres. Of this harvest, 790 acres are planned for partial cut; the remainder are planned for clearcut harvest.

The retention of reserve trees is planned to varying degrees for all units proposed for clearcutting. Alternative 3 schedules 1,777 acres in 40 units for helicopter yarding; the remainder would be yarded by conventional methods. To implement this harvest, approximately 56 miles of new road would be constructed and 1.5 miles of existing road would require reconstruction.

One new LTF would be needed near Sunny Cove for the harvest of approximately 5 MMBF. Remaining timber harvested would be hauled to existing LTF's on Twelvemile Arm and Polk Inlet. The existing logging camp at Polk Inlet is all that would be required to support the harvest of approximately 114 MMBF. A floating camp at or near Sunny Cove would be required to support the remaining 5 MMBF of harvest.

Economic Outputs—Preliminary economic analysis indicates that Alternative 3 would produce an overall net mid-market stumpage value in the range of $4.54 to $20.01 per MBF, depending on the cost method used. The PNV of Alternative 3 was estimated to be in the range of -$4.60 million to -$2.75 million. Payments to the State of Alaska resulting from Alternative 3, were estimated at $2.32 million. Average annual direct jobs created were estimated at 237 over 4 years.

Environmental Consequences—A summary of the environmental consequences of implementing Alternative 3 by significant issue is presented below.

Issue 1: Wildlife Habitat

- The major effect would be the harvest of 4,711 acres of wildlife habitats. This includes 4,016 acres of old-growth forest habitat (Volume Classes 4-7) or about 6 percent of the total remaining old growth.

- TTRA proportionality would be 0.53 percent less than the baseline for MA K17 and 0.27 percent less than the baseline for MA K18.

- The 58 miles of road construction/reconstruction would provide new access into unroaded areas. The new LTF and floating camp would result in additional habitat and disturbance impacts.

- About 341 acres of habitats in the Indian Creek drainage would be harvested and about 192 acres in the high-value area around Cholmondeley Sound would be harvested.

- This alternative would involve substantial harvest within the HCA's of Retention Strategy A. It would include 37 harvest units in medium HCA's and 11 harvest units in small HCA's.

- The area in unfragmented old-growth patches greater than 10,000 acres in size would be reduced by 11,014 acres; the area in patches greater than 5,000 acres would be reduced by 11,014 acres.

- Sitka black-tailed deer habitat capability would be reduced by 4.3 percent and 4.6 percent of all medium to high quality winter range would be harvested.

- Reductions in habitat capability for all MIS would range from 0 to 6.5 percent.

- Threatened or endangered species would not be affected.

Issue 2: Fish Habitat and Water Quality

- No measurable effects on fish habitat or water quality are expected due to implementation of TTRA buffers, additional-width buffers, BMP's, and other mitigation measures.

- Three harvest units and associated roads would occur within the watershed of Fubar Creek, which is on the State of Alaska impaired water body list.

- Cumulative watershed harvest thresholds would not be exceeded for any major watershed.

- Measures of potential risk to water quality and fish habitat are as follows: (1) a soil disturbance index of 886 acres was estimated due to timber harvest and road construction; (2) 1,480 acres of high hazard soils and 0 acres of very high hazard soils would be harvested; and (3) 605 acres of riparian area (primary around lakes and along Class III streams) would be harvested outside of no-cut buffers. Additionally, roads would cross 12 Class I, 10 Class II, and 127 Class III streams, and streamside vegetation would be removed along 26 miles of Class III streams and at stream road crossings.

Issue 3: Subsistence

- About 403 acres used by more than 10 percent of rural community households for deer hunting would be harvested.

- Based on the wildlife analysis and projected harvest levels, deer habitat capability would be well above that needed to support the deer population needed to support current harvest levels. However, a significant restriction of subsistence deer hunting may occur prior to 2054 if scheduled timber harvesting occurs.

- A significant possibility of a significant restriction of subsistence use of black bear and marten would occur in some areas.

Issue 4: Timber Economics and Supply

- Preliminary economic analysis indicates an overall net mid-market stumpage value in the range of $4.54/MBF to $20.01/MBF. The PNV's associated with these stumpage values would range from -$4.60 million to -$2.75 million. Negative PNV's are not uncommon for initial entry sales, which is what this alternative primarily represents. Future entries would be more positive, since the basic road system would be in place.

- After implementation of Alternative 3, 1,428 acres or 67 percent of the remaining acreage from the current unit pool would be available for cable yarding in the next entry—the rest would require helicopter yarding.

- Timber supply analysis indicates that, given certain conditions, sufficient timber would be available both within the Polk Inlet Project Area and on Prince of Wales Island as a whole to support scheduled timber harvest through the end of the first rotation (Year 2054) when second growth would become widely available for harvest. However, this conclusion depends on timber values increasing and/or improved or more efficient logging systems being developed to make economically marginal harvest units more attractive. It also depends on the assumption that no new land use allocations are made in the future that would reduce the timber base.

Issue 5: Visual Quality, Recreation, and Tourism

- Changes in the visual quality of the sensitive area along the Alaska Ferry Route and near the community of Hollis would occur. The future visual condition (FVC) of views to the south would change from generally untouched (I) to moderately altered (IV). Changes would be evident from the viewing corridor along the Hollis-Klawock Highway, at the overlook west of Hollis, and at the junction with the Hydaburg Road.

- Effects on the visual quality inside Twelvemile Arm would be high. The FVC would generally change from untouched (I) and slightly altered (III) to heavily altered (V). Harvest activities would be visible from future recreation sites at the head of the Arm.

- Limited harvest would slightly change the visual quality in the Cholmondeley Sound area. The FVC would remain generally untouched (I), except in the Sunny Cove area, where it would change to slightly altered (III).

- Timber harvest would have minimal effects on existing and potential recreation sites.

- Timber harvest and road construction would result in a change of 33,900 acres from unroaded to roaded ROS settings.

Issue 6: Social and Economic Factors

- Payments to the State of Alaska (under the National Forest Receipts Act) resulting from this alternative were estimated at $2.3 million based on preliminary economic analysis.

- About 237 annual direct jobs would be created over 4 years.

- Timber harvest and road construction would generally have minimal effects on the resource-based lifestyles of communities in and near the Project Area. One exception would be on the residents of the small group of cabins at Sunny Cove. Timber harvesting, road and LTF construction, and the existence of a nearby logging camp would result in a change in the natural character of the area and at least a temporary increase in the competition for fish, wildlife, and recreation resources due to residents of the logging camp.

Issue 7: Local Water Supplies

- Timber harvest and road construction are not expected to affect local water supplies in the Project Area. Although these activities would take place near the water supply for the cabins at Sunny Cove, mitigation measures would be implemented to ensure that effects would be avoided.

Issue 8: Caves

- Two harvest units in this alternative were identified during field surveys as having potentially significant cave resources. Identified mitigation measures would be implemented to avoid effects to these caves unless further field surveys and analysis determine that they are not significant resources.

Log tow

Alternative 4

Framework—The framework for Alternative 4 emphasizes timber economics and conventional cable yarding methods with the requirement of harvesting approximately 125 MMBF. It would include less helicopter yarding. It emphasizes a positive net economic return for the proposed harvest units by attempting to minimize logging and road construction costs.

Resource Outputs—Implementation of Alternative 4 would result in the harvest of 3,913 acres in 87 harvest units producing approximately 119 MMBF of net sawlog and utility volume. This volume includes approximately 7 MMBF from road ROW clearing. Average unit size would be about 45 acres and 3 units would exceed 100 acres. Of this harvest, 259 acres are planned for partial cut; the remainder are planned for clearcut harvest. The retention of reserve trees is planned to varying degrees for all units proposed for clearcutting. Alternative 4 schedules 471 acres in 9 units for helicopter yarding; the remainder would be yarded by conventional methods. To implement this harvest, approximately 54 miles of new road would be constructed and 1 mile of existing road would require reconstruction.

One new LTF would be needed near Chomly on the West Arm of Cholmondeley Sound for the harvest of approximately 5 MMBF. Remaining timber harvested would be hauled to existing LTF's on Twelvemile Arm and Polk Inlet and to the LTF's already scheduled for development on the west side of McKenzie Inlet and near Little Coal Bay. The existing logging camp at Polk Inlet would support the harvest of approximately 104 MMBF including the volume in McKenzie Inlet. A floating camp at or near Chomly would be required to support 5 MMBF of the remaining harvest and the floating camp to be developed near Little Coal Bay during the 1989-94 Operating Period would be needed to support the remaining 10 MMBF.

Economic Outputs—Preliminary economic analysis indicates that Alternative 4 would produce an overall net mid-market stumpage value in the range of $33.23 to $37.73 per MBF, depending on the cost method used. The PNV of Alternative 4 was estimated to be in the range of -$0.38 million to $0.16 million. Payments to the State of Alaska resulting from Alternative 4 were estimated at $3.01 million. Average annual direct jobs created were estimated at 220 over 4 years.

Environmental Consequences—A summary of the environmental consequences of implementing Alternative 4 by significant issue is presented below.

Issue 1: Wildlife Habitat

- The major effect would be the harvest of 3,913 acres of wildlife habitats. This includes 3,512 acres of old-growth forest habitat (Volume Classes 4 to 7) or about 5 percent of the total remaining old growth.
- TTRA proportionality would be 0.34 percent less than the baseline for MA K17 and 0.53 percent less than the baseline for MA K18.
- The 55 miles of road construction/reconstruction would provide new access into unroaded areas. The new LTF and floating camp would result in additional habitat and disturbance impacts.
- About 136 acres of habitats in the high-value Indian Creek drainage would be harvested and about 136 acres in the high-value area around Cholmondeley Sound would be harvested.
- This alternative would involve substantial harvest within the HCA's of Retention Strategy A. It would include 22 harvest units of medium HCA's and 1 harvest unit in a small HCA.
- The area in unfragmented old-growth patches greater than 10,000 acres in size would be reduced by 11,625 acres; the areas in patches greater than 5,000 acres would be reduced by 2,301 acres.
- Sitka black-tailed deer habitat capability would be reduced by 4.3 percent and 5.9 percent of all medium to high quality winter range would be harvested.
- Reductions in habitat capability for all MIS would range from 0 to 6.7 percent.
- Threatened or endangered species would not be affected.

Issue 2: Fish Habitat and Water Quality

- No measurable effects on fish habitat or water quality are expected due to implementation of TTRA buffers, additional-width buffers, BMP's, and other mitigation measures.
- Two harvest units and associated roads would occur within the watershed of Fubar Creek, which is on the State of Alaska impaired water body list.
- Cumulative watershed harvest thresholds would not be exceeded for any major watershed.

- Measures of potential risk to water quality and fish habitat are as follows: (1) a soil disturbance of 883 acres was estimated due to timber harvest and road construction; (2) 1,747 acres of high hazard soils and zero acres of very high hazard soils would be harvested; and (3) 462 acres of riparian area (primary around lakes and along Class III streams) would be harvested outside of no-cut buffers. Additionally, roads would cross 9 Class I, 10 Class II, and 124 Class III streams, and streamside vegetation would be removed along approximately 23 miles of Class III streams and at stream road crossings.

Issue 3: Subsistence

- About 399 acres used by more than 10 percent of rural community households for deer hunting would be harvested.

- Based on the wildlife analysis and existing harvest levels, deer habitat capability would be well above that needed to support the deer population needed to support projected harvest levels. However, a significant restriction of subsistence deer hunting may occur prior to 2054 if scheduled timber harvesting occurs.

- A significant possibility of a significant restriction of subsistence use of black bear and marten would occur in some areas.

Issue 4: Timber Economics and Supply

- Preliminary economic analysis indicates an overall net mid-market stumpage value in the range of $33.23/MBF to $37.73/MBF. The PNV's associated with these stumpage values would range from -$0.38 million to $0.16 million.

- After implementation of Alternative 4, 923 acres or 32 percent of the remaining acreage from the current unit pool would be available for cable yarding in the next entry—the rest would require helicopter yarding. Although some additional cable yarding units would become available for harvest prior to the next entry, the economic viability of this entry could be compromised.

- Timber supply analysis indicates that, given certain conditions, sufficient timber would be available both within the Polk Inlet Project Area and on Prince of Wales Island as a whole to support scheduled timber harvest through the end of the first rotation (Year 2054) when second growth would become widely available for harvest. However, this conclusion depends on timber values increasing and/or improved or more efficient logging systems being developed to make economically marginal harvest units more attractive. It also depends on the assumption that no new land use allocations are made in the future that would reduce the timber base.

Issue 5: Visual Quality, Recreation, and Tourism

- Changes in the visual quality of the sensitive area along the Alaska Ferry Route and near the community of Hollis would not occur. No changes would be evident from the viewing corridor along the Hollis-Klawock Highway.

- Effects on the visual quality inside Twelvemile Arm would be high. The FVC would generally change from untouched (I) and slightly altered (III) to heavily altered (V), except along much of the eastern shore which would remain slightly altered (III). Harvest activities would be visible from future recreation sites at the head of the arm.

- Limited harvest would occur to change the visual quality in the Cholmondeley Sound Area. The FVC would remain generally untouched (I), except in the Cannery Creek area, where it would change to moderately altered (IV).

- Timber harvest would have minimal effects on existing and potential recreation sites.

- Timber harvest and road construction would result in a change of 18,900 acres from unroaded to roaded ROS settings.

Issue 6: Social and Economic Factors

- Payments to the State of Alaska (under the National Forest Receipts Act) resulting from this alternative were estimated at $3.0 million based on preliminary economic analysis.

- About 220 annual direct jobs would be created over 4 years.

- Timber harvest and road construction would generally have minimal effects on the resource-based lifestyles of communities in and near the Project Area. One exception would be on the residents of the small group of cabins at the mouth of Cannery Creek on the south side of Cholmondeley Sound. Timber harvesting, road and LTF construction, and the existence of a nearby logging camp would result in a change in the natural character of the area and at least a temporary increase in the competition for fish, wildlife, and recreation resources due to residents of the logging camp.

Issue 7: Local Water Supplies

- Timber harvest and road construction would are not expected to affect local water supplies in the Project Area. Although these activities would take place near the water supply for the cabins at the mouth of Cannery Creek, mitigation measures would be implemented to ensure that effects would be avoided.

Issue 8: Caves

- Two harvest units in this alternative were identified during field surveys as having potentially significant cave resources. Identified mitigation measures would be implemented to avoid effects to these caves unless further field surveys and analysis determine that they are not significant resources.

Alternative F5

Framework—The framework for Alternative F5 emphasizes retaining contiguous old-growth areas for wildlife habitat. It would seek to defer harvest activities and road construction in those areas that currently contain relatively unfragmented old growth (e.g., along Cholmondeley Sound and Sunny Creek) and that would better link large old-growth areas with the Project Area. An old-growth retention strategy was developed for this alternative that fits ongoing Forest-wide planning efforts to maintain well distributed viable wildlife populations. This strategy has larger habitat conservation areas and wider corridors than the one developed for Alternative F2. As such, it provides more options for future Forest-wide planning. It would avoid harvest in most areas of previously mapped old growth (extended rotation and retention). However, it would permit harvesting in those previously mapped old-growth areas that are in partially fragmented land. It would avoid harvest in the Indian Creek drainage and other areas of high wildlife value. The alternative also avoids harvest and road construction in the Fubar Creek watershed.

Resource Outputs—If Alternative F5 were implemented, it would result in the harvest of 3,306 acres in 71 harvest units producing approximately 88 MMBF of net sawlog and utility volume. This volume includes approximately 4 MMBF from road ROW clearing. Average unit size would be about 47 acres and 4 units would exceed 100 acres. Of this harvest, 319 acres are planned for partial cut; the remainder are planned for clearcut harvest. The retention of reserve trees is planned to varying degrees for all units proposed for clearcutting. Alternative F5 schedules 803 acres in 19 units for helicopter yarding; the remainder would be yarded by conventional methods. To implement this harvest, approximately 37 miles of new road would be constructed.

No new LTF's would be needed. Timber harvested would be hauled to existing LTF's on Twelvemile Arm and Polk Inlet and to two LTF's already scheduled for development on the east side of McKenzie Inlet and near Little Coal Bay. The existing logging camp at Polk Inlet would support the harvest of approximately 78 MMBF. A floating camp to be developed near Little Coal Bay during the 1989-94 Operating Period would be required to support the remaining 10 MMBF of harvest.

Economic Outputs—Preliminary economic analysis indicates that Alternative F5 would produce an overall net mid-market stumpage value in the range of $29.16 to $39.99 per MBF, depending on the cost method used. The PNV of Alternative F5 was estimated to be in the range of -$1.03 million to -$0.09 million. Payments to the State of Alaska resulting from Alternative F5 were estimated at $2.01 million. Average annual direct jobs created were estimated at 166 over 4 years.

Environmental Consequences—A summary of the environmental consequence of implementing Alternative F5 by significant issue is presented below.

Issue 1: Wildlife Habitat

- The major effect would be the harvest of 3,306 acres of wildlife habitats. This includes 2,857 acres of old-growth forest habitat (Volume Classes 4 to 7) or about 4 percent of the total remaining old growth.

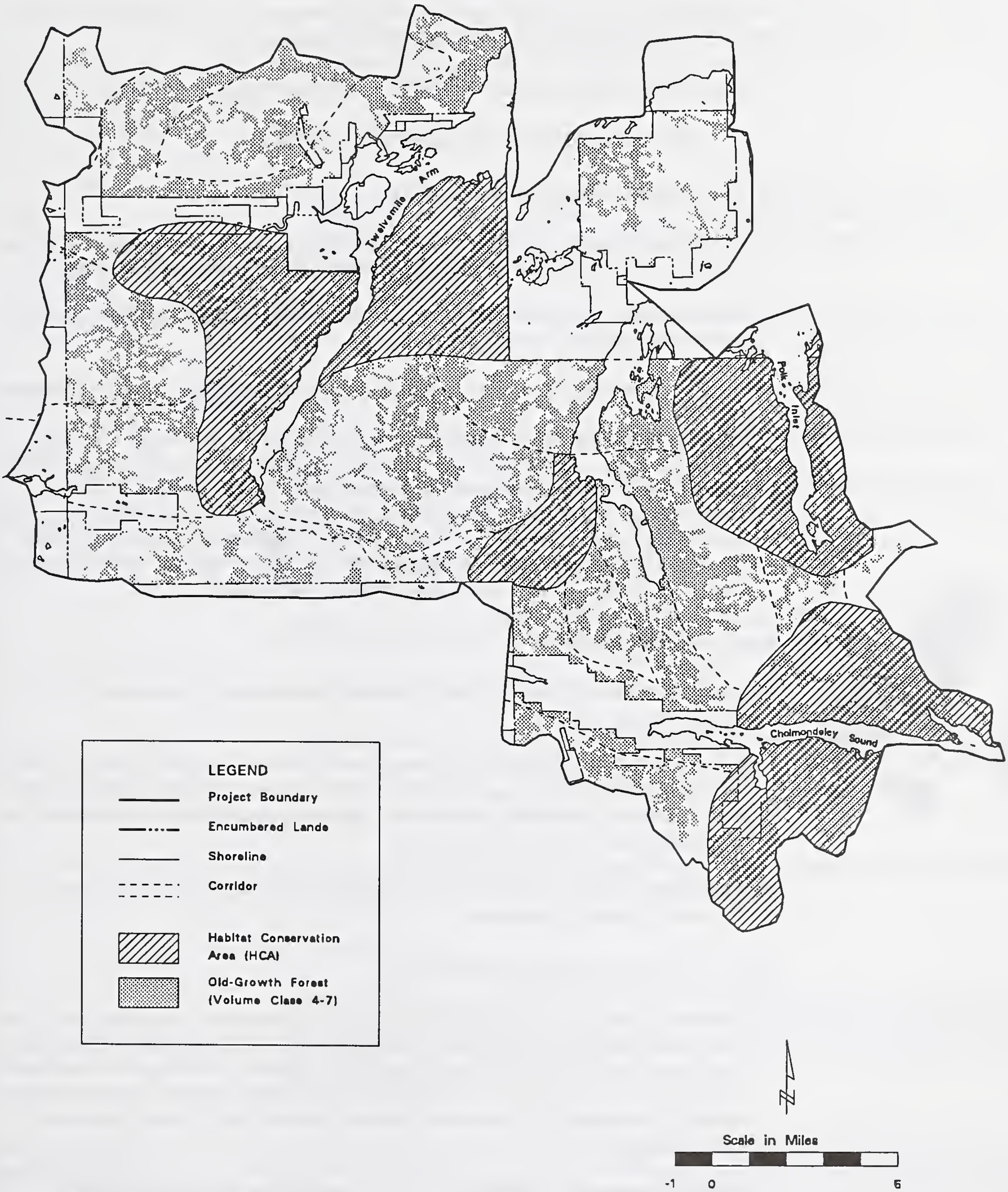
- TTRA proportionality would be 0.36 percent less than the baseline for MA K17 and 0.08 percent lower than the baseline for MA K18.

- The 37 miles of road construction/reconstruction would provide new access into unroaded areas. Because no new LTF's or logging camps would be required, habitat and disturbance impacts from these sources would be avoided.

- Impacts to high-value habitats in the Indian Creek drainage and around Cholmondeley Sound would be avoided.

- This alternative would incorporate the old-growth retention strategy (referred to Retention Strategy B) shown in Figure 2-2. Most of the changes between Alternative 5 of the Draft EIS and Alternative F5 were designed to make Alternative F5 consistent with Retention Strategy B. This retention strategy includes 61,176 acres of HCA's, including three medium and three small HCA's, and 56,324 acres of corridors. The HCA's include 30,173 acres of old-growth forest, which would serve as retention. Alternative F5 includes no harvest units within the HCA's and five units within the corridors of Retention Strategy B.

Figure 2-2
Old-Growth Retention Strategy B



- The area in unfragmented old-growth patches greater than 10,000 acres in size would be reduced by 11,365 acres; the area in patches greater than 5,000 acres would be reduced by 1,738 acres.

- Sitka black-tailed deer habitat capability would be reduced by 3.2 percent and 3.8 percent of all medium to high quality winter range would be harvested.

- Reductions in habitat capability for all MIS would range from 0 to 4.9 percent.

- Threatened or endangered species would not be affected.

Issue 2: Fish Habitat and Water Quality

- No measurable effects on fish habitat or water quality are expected due to implementation of TTRA buffers, additional-width buffers, BMP's, and other mitigation measures.

- No harvest units or roads would be developed in the watershed of Fubar Creek, which is on the State of Alaska impaired water body list.

- Cumulative watershed harvest thresholds would not be exceeded for any major watershed.

- Measures of potential risk to water quality and fish habitat are as follows: (1) a soil disturbance index of 618 acres was estimated due to timber harvest and road construction; (2) 1,639 acres of high hazard soils and 0 acres of very high hazard soils would be harvested; and (3) 307 acres of riparian area (primarily along Class III streams and around lakes) would be harvested outside of no-cut buffers. Additionally, roads would cross 5 Class I, 4 Class II, and 75 Class III streams, and streamside vegetation would be removed along 14 miles of Class III streams, and at stream road crossings.

Issue 3: Subsistence

- About 245 acres used by more than 10 percent of rural community households for deer hunting would be harvested.

- Based on the wildlife analysis and existing harvest levels, deer habitat capability would be well above that needed to support the deer population needed to support projected harvest levels. However, a significant restriction of subsistence deer hunting may occur prior to 2054 if scheduled timber harvesting occurs.

- A significant possibility of a significant restriction of subsistence use of black bear and marten would occur in some areas.

Issue 4: Timber Economics and Supply

- Preliminary economic analysis indicated an overall net mid-market stumpage value in the range of $29.16/MBF to $39.99/MBF. The PNV's associated with these stumpage values would range from -$1.03 million to -$0.09 million. Negative PNV's are not uncommon for initial entry sales, which is what this alternative primarily proposes. Future entries to harvest the remaining old growth would be more positive, since the basic road system would be in place.

- After implementation of Alternative F5, 1,890 acres or 53 percent of the remaining acreage from the current unit pool would be available for cable yarding in the next entry—the rest would require helicopter yarding.

- Timber supply analysis indicates that, given certain conditions, sufficient timber would be available both within the Polk Inlet Project Area and on Prince of Wales Island as a whole to support scheduled timber harvest through the end of the first rotation (Year 2054) when second growth would become widely available for harvest. However, this conclusion depends on timber values increasing and/or improved or more efficient logging systems being developed to make economically marginal harvest units more attractive. It also depends on the assumption that no new land use allocations are made in the future that would reduce the timber base.

Issue 5: Visual Quality, Recreation, and Tourism

- Changes in the visual quality of the sensitive area along the Alaska Ferry Route and near the community of Hollis would not occur. The only change that would occur within the viewing corridor along the Hollis-Klawock Highway would be at the junction with the Hydaburg Road.

- Effects on the visual quality inside Twelvemile Arm would be low. Harvest activities would not be visible from future recreation sites at the head of the Arm.

- No harvest would occur to change the visual quality in the Cholmondeley Sound area.

- Timber harvest would have minimal effects on existing and potential recreation sites.

- Timber harvest and road construction would result in a change of 18,700 acres from unroaded to roaded ROS settings.

Issue 6: Social and Economic Factors

- Payments to the State of Alaska (under the National Forest Receipts Act) resulting from this alternative were estimated at $2.0 million based on preliminary economic analysis.

- About 166 annual direct jobs would be created over 4 years.

- Timber harvest and road construction would have minimal effects on the resource-based lifestyles of communities in and near the Project Area.

Issue 7: Local Water Supplies

- Timber harvest and road construction would have no affect on local water supplies in the Project Area.

Issue 8: Caves

- One harvest unit in this alternative was identified during field surveys as having potentially significant cave resources. Identified mitigation measures would be implemented to avoid effects to these caves unless further field surveys and analysis determines that they are not significant resources.

Little Coal Bay Subalternative

The group of units and roads just south of Kasaan Bay in VCU's 612 and 613 is commonly referred to as the Little Coal Bay area. This area is included under Alternatives F2, 4, and F5. A minor subalternative is being considered to reduce harvest costs associated with this area.

The 1989-94 EIS includes LTF construction, road construction, and timber harvest in the Little Coal Bay area, which has not yet been implemented. Instead of implementing the 1989-94 construction and harvest followed by the Polk Inlet Little Coal Bay construction and harvest, both projects could be combined and LTF construction avoided by hauling timber to existing LTF's on Native corporation land at Kina Cove and/or Smith Cove.

Three options within this subalternative have been considered. One is to haul all timber northwest to Kina Cove. Under this option, the Little Coal Bay LTF and 1.3 miles of road to the LTF would not be needed; however, 1.2 miles of road would be required to interconnect the Little Coal Bay area with the Sealaska Corporation road system to the west and ultimately to the LTF at Kina Cove. A second option is to haul all timber southeast to Smith Cove. Under this option, the Little Coal Bay LTF and 1.3 miles of road to the LTF would not be needed; but 0.3 mile of road would be required to interconnect the Little Coal Bay sale area with the Kavilco Village Corporation road system to the east and ultimately to the LTF at Smith Cove. A third option is to haul all timber in the west portion of the sale area to Kina Cove and haul all the timber in the east to Smith Cove. This option would result in elimination of the Little Coal Bay LTF and 1.3 miles of road construction but would require 1.5 miles of road construction to interconnect the area roads with Native corporation road networks on the west and east.

Construction costs would be similar or slightly lower for the various options of the subalternative, but log haul costs would be higher relative to the original plan. Environmental consequences would not be appreciably different, except for those associated with Little Coal Bay LTF construction, which would be avoided under the subalternative.

Preferred Alternative

Based on a full evaluation comparing the benefits and adverse effects of each alternative with the issues, the USDA Forest Service has identified Alternative F2 as the preferred alternative for this EIS. A final determination will be made by the Ketchikan Area Forest Supervisor in the Record of Decision (ROD).

Comparison and Evaluation of Alternatives

This section presents the environmental consequences of the alternatives in a comparative format. First, a summary of the physical and economic outputs of the alternatives are presented in Table 2-1. Next, the environmental consequences of the alternatives are summarized in Table 2-2. All numbers presented in these two tables are either absolute or relative to Alternative 1. Thus, Alternative 1a numbers do not show a change from current conditions, but rather relative to Alternative 1. Finally, the alternatives are compared and evaluated relative to the significant issues identified in Chapter 1. For more detailed descriptions of the affected environment and the environmental consequences of the alternatives, refer to Chapters 3 and 4, respectively.

Issue 1: Wildlife Habitat

The major effects on wildlife habitats in all action alternatives are the reduction of old-growth forest habitat (Volume Classes 4 to 7) and the increased access provided by the construction or reconstruction of roads into presently unroaded areas (Figure 2-3).

Alternative 3 would result in the greatest effects on old-growth habitat and effects due to increased access, while Alternative F5 would result in the least among the action alternatives. All alternatives would result in impacts consistent with the implementation of TLMP (1979a, as amended) and Alternative P of the TLMP Draft Revision (1991a).

Table 2-1
Physical and Economic Outputs of Alternatives

Item	Units	Alternative 1a	1	F2	3	4	F5
Timber							
Harvest Units	Number	-52	0	88	113	87	71
Harvest Units	Acres	-2,587	0	3,951	4,711	3,913	3,306
Avg. Unit Size		49.8	0	44.9	41.7	45.0	46.6
Avg. Volume per acre (in units)		-	0	25.8	23.5	28.2	25.0
Units over 100 acres	Number	-	0	4	4	3	4
Total Volume (including ROW)	MMBF	-75	0	108	119	119	88
Silvicultural System							
Partial Cut Harvest	Acres	0	0	388	775	242	302
Clearcut Harvest	Acres	-2,587	0	3,563	3,936	3,671	3,005
Types A & B*	Acres	0	0	2,250	2,449	3,737	1,972
Type C*	Acres	0	0	736	945	368	518
Type D*	Acres	0	0	1,576	542	566	515
Logging system							
Highlead Harvest	Acres	-	0	1,633	1,815	2,085	1,430
Shovel Harvest	Acres	-	0	28	28	28	28
Running Skyline Harvest	Acres	-	0	1,048	836	1,092	913
Live Skyline Harvest	Acres	-	0	0	38	20	0
Slackline Harvest	Acres	-	0	133	162	162	133
Standing Skyline Harvest	Acres	-	0	0	55	55	0
Helicopter Harvest	Acres	-	0	1,108	1,777	471	803
Proposed Proportionality							
Management Area K17 (TTRA Baseline=12.14 %)	Percent	12.17	11.53	11.70	11.61	11.80	11.78
Management Area K18 (TTRA Baseline=38.40%)	Percent	37.41	37.59	38.33	38.13	37.87	38.32
Roads and Facilities							
Road Construction/Reconstruction	Miles	-35	0	42	58	55	37
Road Construction/Reconstruction	Acres	-175	0	209	355	335	188
New Log Transfer Facilities	Number	-3	0	0	1	1	0
Potential for New Logging Camps	Number	-1	0	0	1	1	0
Economics							
Estimated Net Stumpage							
Method 1	$/MBF	-	0	39.53	20.01	37.73	39.99
Method 2	$/MBF	-	0	27.33	4.54	33.23	29.16
Present Net Value							
Method 1	$1,000	-	0	21	-2,747	160	-90
Method 2	$1,000	-	0	-1,292	-4,596	-376	-1,035
Payments to State of Alaska	$ million	-	0	2.33	2.32	3.01	2.01
Average Annual Direct Jobs Over 4 Years	# of jobs	-	0	206	237	220	166

* Clearcut types represent different degrees of reserve tree retention. All clearcuts are either Type A, B, or C. Some are also Type D. For these, half the acreage is assigned to the Type D and half to the Type A, B, or C categories. See Table 2-3 and Chapter 3 for descriptions.

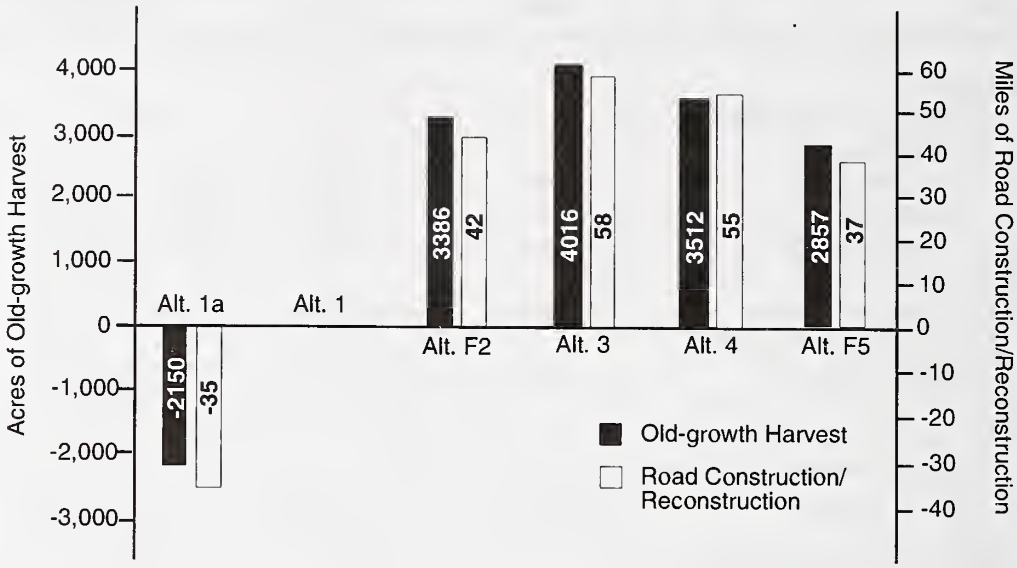
Table 2-2
Environmental Consequences of Alternatives

Item	Units	Alternative 1a	1	F2	3	4	F5
Caves							
Harvest Units Potentially Affecting	# of Units	-	0	1	2	2	1
Soils							
Area of Soil Disturbance							
Harvest Units	Acres	-	0	280	303	336	244
Roads and Landings	Acres	-	0	420	583	547	374
Total Area Affected by Mass Movement Index Category							
Very High MMI	Acres	-	0	0	0	0	0
High MMI	Acres	-	0	1,826	1,480	1,747	1,639
Wetlands, Floodplains, & Riparian							
Wetland Area Affected							
Harvest Units	Acres	-801	0	1,630	997	1,435	1,613
Roads	Acres	-151	0	261	160	254	240
Class I/II Stream Floodplain Road Crossings	Number	8	0	5	6	3	3
Riparian Management Area Harvested	Acres	-253	0	411	605	462	307
Fish and Water Quality							
Road Crossings							
Class I Streams	Number	-11	0	3	12	9	5
Class II Streams	Number	-5	0	10	10	10	4
Class III Streams	Number	-32	0	88	127	124	75
Streamside Vegetation Clearing							
Harvest Units	Miles	-	0	16.9	24.8	22.0	13.6
Roads	Miles	-	0	1.0	1.3	1.3	0.6
Wildlife							
Change in MIS Habitat Capability							
Sitka Black-tailed Deer	Percent	+1.8	0	-3.5	-4.3	-4.3	-3.2
Black Bear	Percent	+1.3	0	-0.4	-1.3	-1.3	-0.4
Marten	Percent	+2.6	0	-3.6	-4.7	-4.2	-3.1
Gray Wolf	Percent	+1.8	0	-2.6	-2.6	-2.6	-1.8
River Otter	Percent	0	0	0	0	0	0
Vancouver Canada Geese	Percent	+2.4	0	-2.7	-2.7	-2.9	-2.7
Bald Eagle	Percent	0	0	0	0	0	0
Red-breasted Sapsucker	Percent	+3.5	0	-5.2	-6.5	-5.8	-4.6
Hairy Woodpecker	Percent	+3.9	0	-5.7	-6.4	-6.7	-4.9
Brown Creeper	Percent	+3.4	0	-2.9	-3.5	-4.3	-2.3
Change in Deer Winter Range							
High Quality Winter Range	Percent	+2.5	0	-3.3	-3.3	-4.8	-2.6
Mid Quality Winter Range	Percent	+3.7	0	-6.1	-6.0	-7.0	-5.5
Low Quality Winter Range	Percent	-1.6	0	+2.9	+2.9	+3.6	+2.5

Table 2-2 (continued)
Environmental Consequences of Alternatives

Item	Units	Alternative 1a	1	F2	3	4	F5
Biodiversity							
Unfragmented Old-growth Patches Remaining							
> 10,000 acres	Acres	26,052	25,245	13,760	14,231	13,620	13,880
> 5,000 acres	Acres	31,136	30,245	28,227	19,231	27,944	28,507
> 1,000 acres	Acres	53,961	51,464	46,605	44,861	45,629	47,234
Subsistence							
Deer Habitat Capability	Number	14,382	14,326	14,215	14,189	14,189	14,223
Deer Population Needed to Support 1995 Harvest	Number	2,775	2,775	2,775	2,775	2,775	2,775
Harvest Area Used by > 10% of Rural Community Households for Deer Hunting	Acres	-624	0	405	403	399	245
Visual and Recreation Resources							
Area of Viewshed Harvested							
Twelvemile Arm							
Hollis Area	Acres	0	0	0	289	0	0
Remainder	Acres	-56	0	334	814	628	290
Hollis-Klawock Highway	Acres	0	0	67	74	7	67
Hydaburg Road	Acres	-124	0	305	309	96	305
Forest Road 21	Acres	-211	0	46	46	46	46
Polk Inlet South	Acres	0	0	486	0	432	486
McKenzie Inlet	Acres	-5/8	0	0	0	123	0
Cholmondeley Sound	Acres	0	0	0	40	133	0
ROS Settings							
Change in Area of Unroaded Settings	Acres	+12,100	0	-22,800	-33,900	-18,900	-18,700
Change in ROS at Existing Recreation Sites	# of sites	2	0	4	4	2	4
Change in ROS at Potential Recreation Sites	# of sites	1	0	5	5	1	5
Cultural Resources							
Sites Affected							
Direct Effects	# of sites	0	0	0	0	0	0
Risk of Indirect Effects	# of sites	0	0	1	0	2	0

Figure 2-3
Old-growth Harvest and Road Construction/Reconstruction



As a result of harvest under the 1989-94 EIS, TTRA proportionality (i.e., the proportion of Volume Classes 6 and 7 remaining in each Management Area) would be less than the TTRA baseline for all alternatives. All of the action alternatives would increase proportionalities over existing conditions. Future harvest activities would require harvest of a greater percentage of Volume Classes 4 and 5 in order to increase proportionalities to the baseline. Among the action alternatives, achievement of the baseline under future harvest would be most difficult for Alternative 3 in MA K17 (0.53 percent less than the baseline) and Alternative 4 in MA K18 (0.53 percent less than the baseline).

All action alternatives would reduce the frequency of large, unfragmented old-growth patches (Table 2-1). High-value, relatively unfragmented habitats were identified in the Indian Creek drainage and around Cholmondeley Sound. Alternatives 3 and 4 enter both of these areas, Alternative F2 only enters the Indian Creek drainage, and Alternative F5 avoids both of them. All alternatives avoid the majority of the area around Cholmondeley Sound. Alternative 1a would reduce fragmentation in the Indian Creek drainage relative to Alternative 1.

Two old-growth retention strategies were developed for the Polk Inlet Project. Alternative F2 was designed to be consistent with Retention Strategy A (see Figure 2-1) and Alternative F5 was designed to be consistent with Retention Strategy B (see Figure 2-2). Retention Strategy A provides for 24,241 acres of old-growth retention and Retention Strategy B provides 34,107 acres. Alternatives 3 and 4 involve substantial harvest within the HCA's and corridors of both retention strategies; thus, compromising the ability of the HCA's and corridors of either retention strategy to function within the Project Area.

MIS habitat capability would be reduced under the action alternatives by 0 to 6.7 percent depending on the species and alternative (Table 2-2). Harvest of medium to high quality winter range for Sitka black-tailed deer would be highest under Alternative 4 and lowest

under Alternative F5 (Table 2-2). Alternative 1a would avoid reductions in habitat capability and winter range availability that would occur under Alternative 1. None of the alternatives would affect threatened or endangered species.

Issue 2: Fish Habitat and Water Quality

No measurable effects on fish habitat or water quality are expected under any of the alternatives. All alternatives meet the requirement and intent of the Clean Water Act. Implementation of identified fish habitat enhancement opportunities could increase habitat for fish production. Implementation of TTRA-required stream buffers, additional-width buffers per the Proposed Revised Forest Plan Standards and Guidelines, and BMP's and other relative mitigation measures would effectively mitigate fish habitat and water quality impacts. These conclusions are supported by the fish habitat capability models for coho and pink salmon and Dolly Varden char.

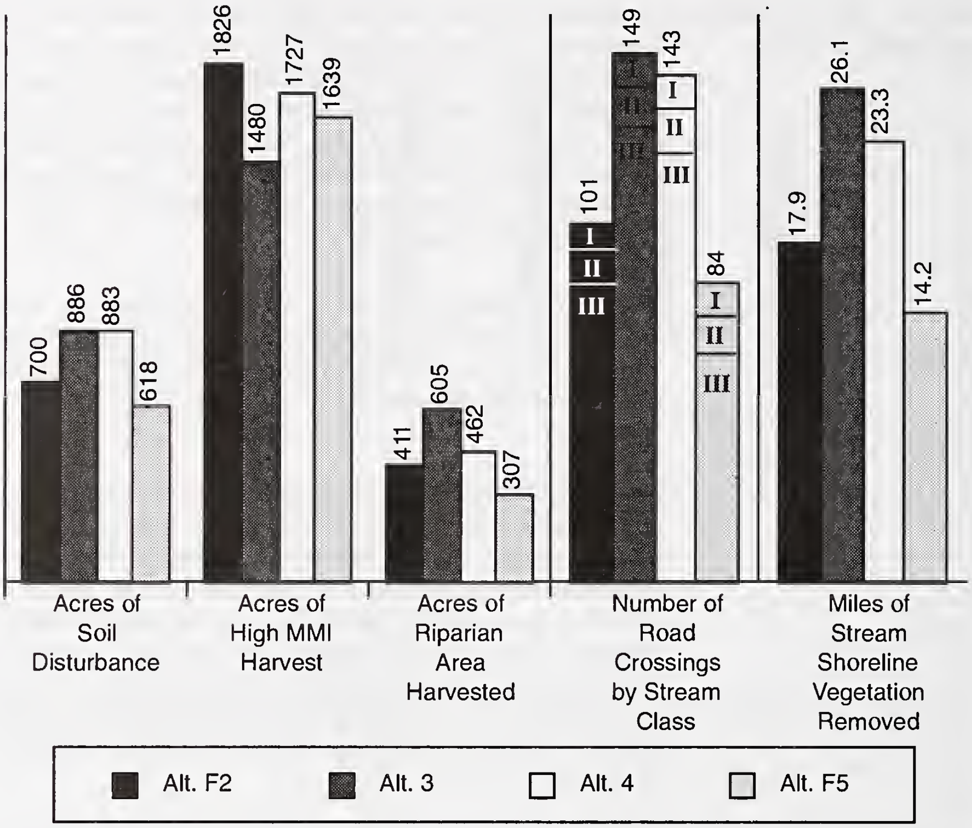
Alternatives 3 and 4 include 2 to 3 harvest units and associated roads within the watershed of Fubar Creek, which is on the State of Alaska impaired water body list. Alternatives F2 and F5 avoid harvest activities in this watershed. Under Alternatives 3 or 4, a more detailed evaluation of the sediment delivery to Fubar Creek would be conducted prior to implementation.

Most major watersheds in the Project Area have experienced prior road construction and timber harvest. Re-entering these drainages may generate a greater potential risk of impacts on water quality, with the risk expected to be greater in those watersheds with the higher cumulative harvest percentages. The standards and guidelines of the Proposed Revised Forest Plan limit the amount of timber harvest within a given watershed to 35 percent of the total land base within a 15-year period. The standards and guidelines also limit the amount of timber harvest in riparian management areas associated with unbuffered Class III streams to 25 percent of the total riparian area within a watershed within a 20-year period. None of the alternatives would permit these thresholds to be exceeded in any of the Project Area's major watersheds.

Additional measures of potential risk to water quality and fish habitat are: (1) an index of the amount of soil disturbance, which is related to the area harvested, the logging systems used, and the area disturbed during road construction; (2) the amount of harvest on slopes with a high mass movement index; (3) the amount of riparian area harvested outside of no-cut buffers (primarily around lakes and along Class III streams); (4) the number of Class I, II, and III stream road crossings; and (5) the length of Class III stream shoreline vegetation removal due to timber harvest and road construction. These measures are quantified in Table 2-2 and are displayed graphically in Figure 2-4 for each of the action alternatives. Review of Figure 2-4 indicates that Alternatives F2 and F5 rank lowest and Alternatives 3 and 4 rank highest in four of the five measures of potential risk.

Figure 2-4

Risk to Water Quality and Fish Habitat, by Alternative



Potential effects on marine habitats and organisms would be less under Alternatives 1, F2, and F5 because new LTF's or logging camps would not be required. Alternative 1a would have positive effects because three new LTF's and one new floating logging camp, required under Alternative 1, would not be needed. Alternatives 3 and 4 would have potential negative effects on a small area and for a short timeframe due to the need for one new LTF and one new floating logging camp.

Issue 3: Subsistence

Deer hunting is the major aspect of subsistence use that is affected by timber harvest. Based on the wildlife analysis, Sitka black-tailed deer habitat capability in the Project Area would be reduced from 3.2 to 4.3 percent by the action alternatives (Table 2-2). Alternative 3 would have the greatest effect and Alternatives F2 and F5 would have the least effect of the action alternatives. Alternative 1 would result in no change and Alternative 1a would result in a 1.8 percent increase in habitat capability relative to Alternative 1. In all cases, the habitat capability is predicted to be well above that needed to support the deer population required to support the current harvest level.

The action alternatives would result in the harvest of from 245 to 405 acres within areas used by more than 10 percent of rural community households for deer hunting. Alternative 1a would prevent the harvest of 624 acres that would be harvested under Alternative 1.

The analysis indicates that none of the alternatives would cause a significant restriction of subsistence deer hunting at this time. However, the analysis suggests that the cumulative effects of scheduled timber harvesting would reduce habitat capabilities sufficiently before the end of the first rotation (Year 2054) to create a significant possibility of a significant restriction of subsistence use of deer in the Project Area. Because current habitat capabilities for black bear and marten are below the estimated population levels needed to support current harvest levels in some areas, all alternatives would result in a significant possibility of a significant restriction of subsistence use of these species, especially if nonrural harvesting is not restricted.

Issue 4: Timber Economics

Preliminary economic analysis indicates overall net mid-market stumpage values would be positive for all action alternatives (Table 2-1). PNV's range from negative to positive, depending on the cost method, for Alternatives F2 and 4, and are negative for Alternatives 3 and F5. Negative PNV's are not uncommon for initial entry sales. All action alternatives are comprised primarily of initial entry sales. Future entries to harvest the remaining old growth would be more positive, since the basic road system would be in place.

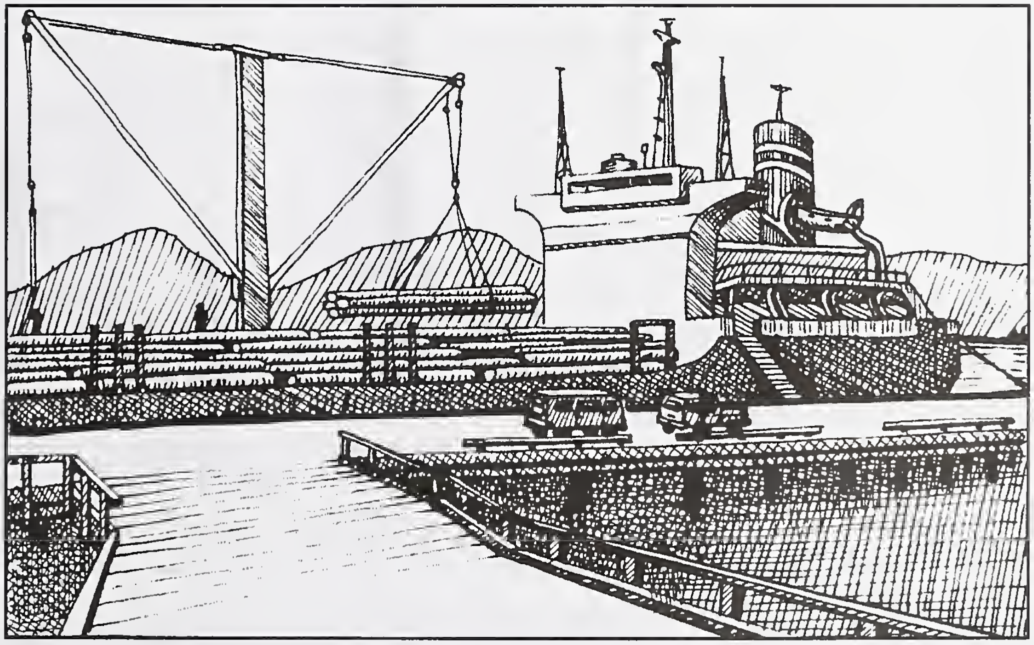
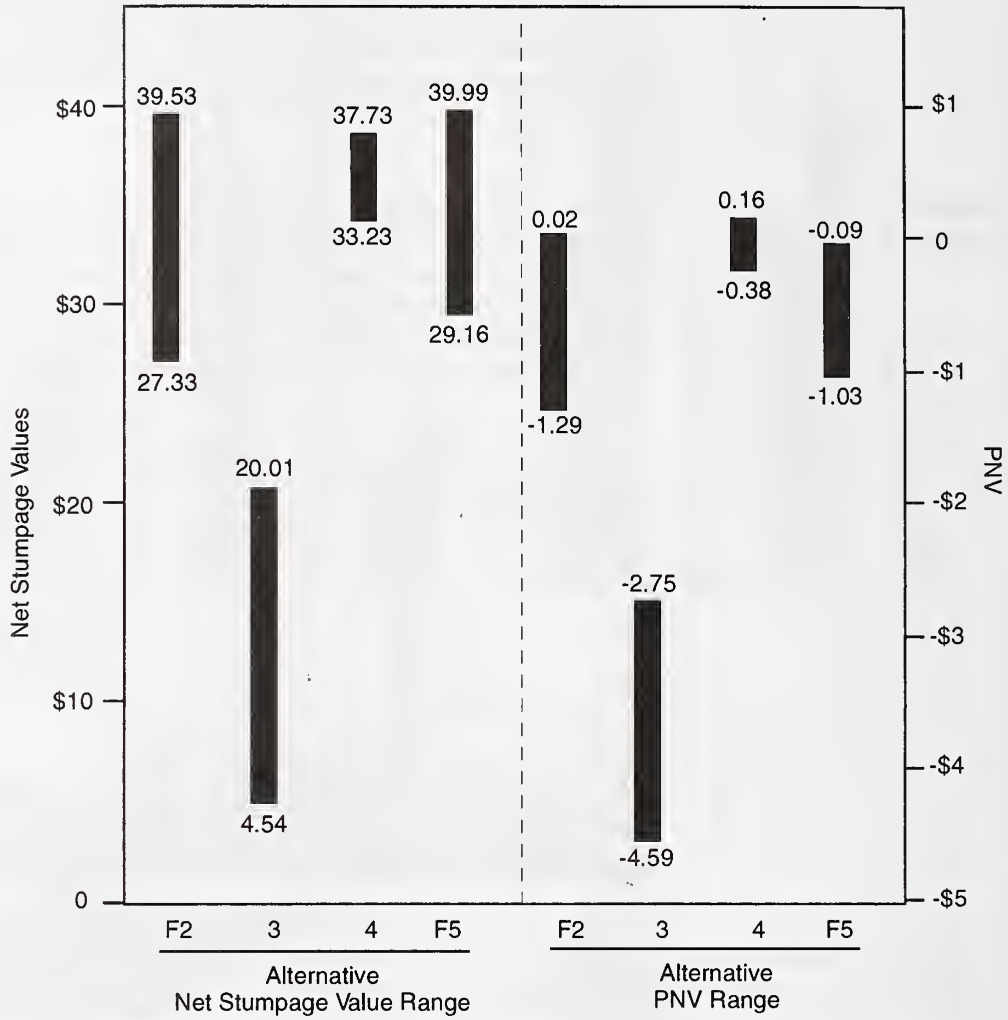


Figure 2-5 compares the stumpage values and PNV's for the action alternatives. Alternatives F2, 4, and F5 would have the highest net stumpage values and PNV's, depending on the cost method, and Alternative 3 would have the lowest values under both cost methods. Because Alternative 4 would construct 13 to 18 more miles of road than Alternative F2 or F5, future timber sales in the tributary area are likely to have higher efficiency.

Figure 2-5
Net Stumpage Values ($/MBF) and PNV's ($million)



Alternative 1 would result in no timber-related economic outputs and therefore would not provide any return to the U.S. Treasury. Alternative 1a would result in reduced timber-related economic outputs and returns to the U.S. Treasury relative to Alternative 1.

After implementation of the Polk Inlet Project, only 923 acres or 32 percent of the remaining acres in the current unit pool would be available for cable yarding under Alternative 4. Alternatives F2, 3, and F5 would have 1,542 acres, 1,428 acres, and 1,890 acres remaining, respectively. The rest of the acreage would require helicopter yarding. The economic feasibility of helicopter yarding is more greatly affected by market values than cable yarding. Thus, although some additional cable yarding units would become available for harvest prior to the next entry, the economic viability of the next entry could be compromised if Alternative 4 is selected for the Polk Inlet Project.

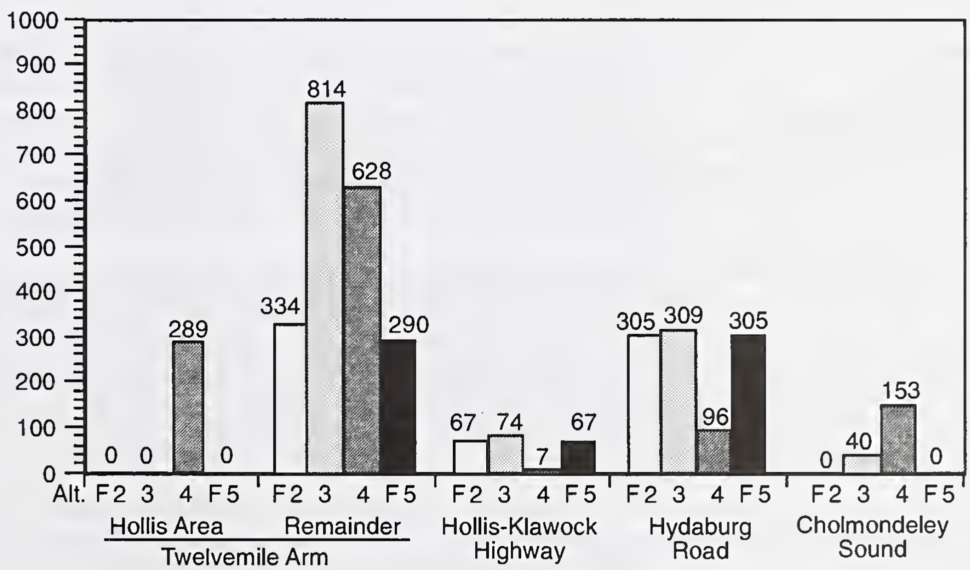
Timber supply analysis indicates that, given certain conditions, sufficient timber would be available both within the Polk Inlet Project Area and on Prince of Wales Island as a whole to sustain the scheduled timber harvest through the end of the first rotation (Year 2054) when

second growth would become widely available for harvest. However, this conclusion depends on timber values increasing and/or improved or more efficient logging systems being developed to make economically marginal timber more attractive. It also assumes that no new land use allocations are made in the future that would reduce the timber base.

Issue 5: Visual Quality, Recreation and Tourism

During the Project Area visual assessment, seven viewsheds were identified. Among these, four are considered most important for comparison because of their visual sensitivity and the presence of harvest units within them, at least for some alternatives. The degree of change in these key viewsheds is displayed in terms of the acres harvested under each action alternative in Figure 2-6.

Figure 2-6
Acreage Harvested in Key Viewsheds



The most significant change would occur under Alternative 3 in views to the south of the Hollis area and the ferry route. Although mitigation has reduced the degree of change so that the VQO would be met, a change from generally untouched (I) to moderately altered (IV) would occur. In all other alternatives, no change would occur in this scenic viewshed.

The second greatest change would occur in mid and upper Twelvemile Arm, also under Alternative 3. In this situation, the FVC would change from untouched (I) and slightly altered (III) to heavily altered (V) along most of the slopes. Alternative 4 would have slightly less effect in this area, but would still result in a change to heavily altered (V) along much of the lower elevation slopes. Alternatives F2 and F5 would result in clusters of harvest units in local areas.

Changes in FVC would range from none to slight along the Hollis-Klawock Highway, depending on the alternative. Harvest within most of this corridor was deferred for all alternatives due to the existing cumulative visual disturbance. Similarly, changes in the Cholmondeley Sound area would range from none to slight. Harvest throughout most of this area was deferred until future entries due to cumulative visual disturbance associated with past and anticipated Native corporation harvest and high wildlife and fish habitat values.

Alternative 1 would have no effect on visual quality in the Project Area. Under Alternative 1a, visual quality would remain generally unchanged in the sensitive viewsheds. However, visual quality would be improved in McKenzie Inlet, the Twentymile drainage, and the Indian Creek drainage relative to Alternative 1.

The alternatives would have minimal effects on existing and potential recreation sites. All action alternatives would result in a reduction in the area of unroaded ROS settings (Table 2-2). The greatest reduction would occur under Alternative 3 and the least under Alternative 4. The area of unroaded settings would increase under Alternative 1a relative to Alternative 1.

Issue 6: Social and Economic Factors

Payments to the State of Alaska (under the National Forest Receipts Act) would range from $2.0 million to $3.0 million dollars under the action alternatives. Average annual jobs created would range from 166 to 237 over 4 years. Alternative F5 ranks lowest among the action alternatives in both payments to the State and jobs created. Alternative 1 would eliminate all Project-related receipts to the State and jobs created. Alternative 1a would reduce economic returns to the State and jobs created relative to Alternative 1.

The action alternatives would generally have minimal effect on the resource-based lifestyles of communities in and near the Project Area. Exceptions would be for the residents of Sunny Cove under Alternative 3 and the residents at the mouth of Cannery Creek under Alternative 4. Timber harvesting, road and LTF construction, and the existence of nearby logging camps would result in changes in the natural character of the areas and at least a temporary increase in the competition for natural resources due to residents of the logging camps.

Under Alternatives 1 and 1a, lack of timber activity in the Project Area would likely result in the shutdown of the Polk Inlet logging camp and economic impacts on its residents. Negative economic impacts would, at least temporarily, affect some residents of Craig, Klawock, Hollis, Hydaburg, and Ketchikan who depend directly or indirectly on timber harvesting in the Project Area.

Issue 7: Local Water Supplies

Timber harvest and road construction are not expected to affect local water supplies in the Project Area. Although road construction and timber harvest would take place near water supplies for the cabins at Sunny Cove and Cannery Creek under Alternatives 3 and 4, respectively, mitigation measures would be implemented to avoid effects.

Issue 8: Cave Resources

One to two harvest units in each action alternative were identified during field surveys as having potentially significant cave resources. Mitigation measures would be implemented to avoid impacts unless further surveys determine that there are no significant resources.

Mitigation Measures

The proposed Revised Forest Plan (TLMP Draft Revision 1991a) presents management prescriptions for each land use designation and Forest-wide standards and guidelines which are to be followed in the development of mitigation measures. Likewise, the plan provides forest management goals and objectives but does not contain project decisions. The analysis supporting this EIS discloses possible adverse impacts that are specific to the locality and to the actions proposed. Therefore, measures were formulated to mitigate these impacts guided by forest management goals and objectives, under the overall direction given by the proposed land use designation management prescriptions, and following the proposed Forest-wide standards and guidelines.

Most of these measures are harvest unit- or road-specific, but many of these measures result in the complete elimination or deferral of harvest from geographic areas. These broad measures are identified and discussed first, followed by a summary of the site-specific measures. Mitigation measures are described in more detail in the appropriate sections of Chapter 4. Unit-specific mitigation measures are summarized by harvest unit in Appendix B. These are described in greater detail on the unit design cards in Appendix E.

Mitigation Through Avoidance of Geographic Areas

Although potentially permitted under proposed Forest Plan standards and guidelines, establishment of harvest units within certain geographic areas was deferred, at least for this entry. A summary of the areas avoided and the reasons for their deferral is provided below:

(1) Harvest activities and road building were not proposed at this time in the Maybeso Experimental Forest (VCU 610) based on an evaluation of research opportunities.

(2) Harvest activities and road building were avoided along the Hollis-Klawock Highway in VCU 622. Given the proposed VQO for this area, its status as a Sensitivity Level I Travel Route (see *Visual Resources* section of Chapter 3), and the cumulative effects of previous harvest, additional logging activity was deferred during this entry.

(3) Harvest activities and road building were avoided along Twentymile Creek in VCU 622. Because of the cumulative harvest in this area following implementation of the 1989-94 EIS, all units were deferred because of adjacency, cumulative visual disturbance, or wildlife habitat values.

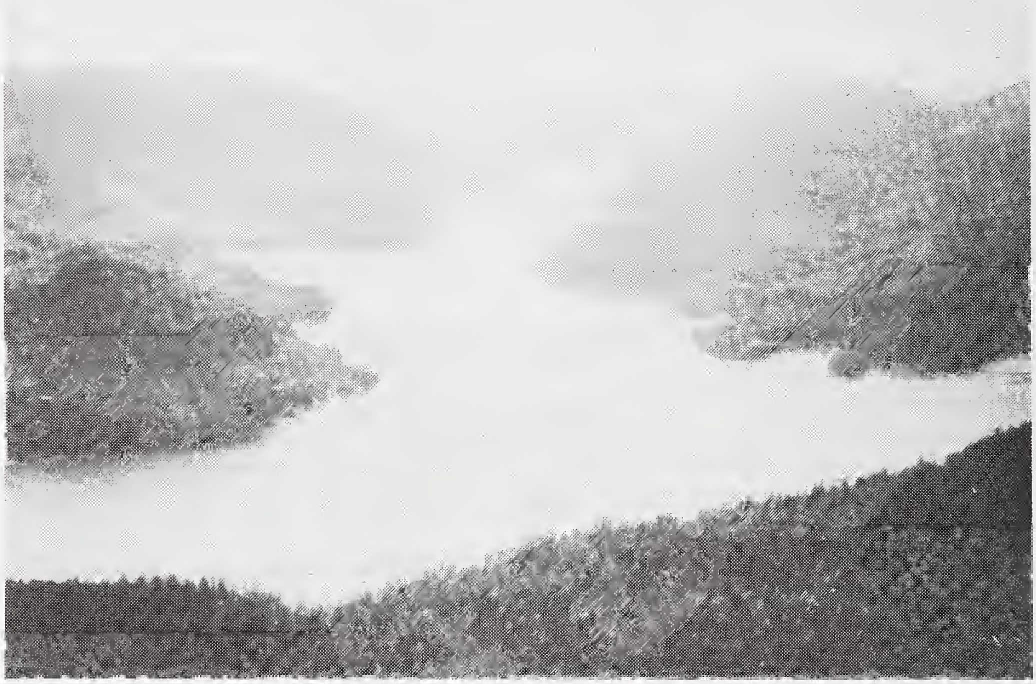
(4) Harvest activities and road building were avoided in the area northeast of Hollis in VCU 611, which was given a Scenic Viewshed LUD under Alternative P of the TLMP Draft Revision (1991a). Because of the proposed VQO for this area, its Sensitivity Level I status (see *Visual Resources* section of Chapter 3), and its low visual absorption capacity, only selective logging or very small clearcuts and limited or no road construction would be permitted under the Forest Plan. For these reasons and because visual concerns derived from scoping comments relative to this area were high, harvest was deferred in this area until future entries.

(5) Harvest activities and road building were avoided near the southwest end of Twelvemile Arm in VCU 621. Given the proposed VQO for this area and the Sensitivity Level I status of the recreation site located here (see *Visual Resources* section of Chapter 3), cumulative visual disturbance caused by logging since the early 1960's was determined to be too high to allow additional logging during this entry.

(6) Harvest activities and road building were avoided in the Beaver Creek watershed (VCU 621) due to high recent cumulative watershed harvest levels including Native corporation land.

(7) Harvest activities and road building were avoided in the Big Creek area, the Sulzer Portage area, and along the West Arm of Cholmondeley Sound west of Cannery Creek in VCU 674. Most of the commercial forest land in these areas is currently encumbered, having been selected by Native corporations. It is reasonably foreseeable that most of this land would be logged following transfer of ownership in the near future. Native lands to the east along the South Arm of Cholmondeley Sound and Dora Bay have been heavily logged. The remaining National Forest System land in this VCU was designated as LUD III under TLMP and was proposed as a Modified Landscape LUD under Alternative P of the TLMP Draft Revision (1991a). The lands on the south side of the West Arm and along Big Creek also have very high wildlife and fish habitat values. Given the potential cumulative effects on visual and wildlife resources associated with past and future logging in this area, entry into areas outside of Cannery Creek was deferred.

South Arm of Cholmondeley Sound



Site-Specific Mitigation Measures

A wide variety of site-specific mitigation measures designed primarily to avoid or minimize adverse impacts, have been evaluated and incorporated into harvest unit and road design, preliminary layout, and would be incorporated into final layout and timber sale implementation. These measures are summarized in Table 2-3 along with the number of harvest units affected for each alternative. A specific listing of each unit affected by each measure is provided in Appendix B. A description of the mitigation measures for each unit and road segment is provided in the unit and road design cards in Appendices E and F.

In addition to the site-specific measures listed in these tables, a variety of other site-specific measures would apply to all harvest and construction activities and would be incorporated as standard clauses in the specifications of all timber sale and road construction contracts. These measures include all appropriate BMP's not specifically identified in the table. Direction for use of BMP's on National Forest System lands in Alaska is included in Chapter 10 of the Region 10 Soil and Water Conservation Handbook (FSH 2509.22) (Forest Service 1991c). The handbook describes the application, monitoring, evaluation, and refinement of these BMP's. Appendix C of the Proposed Revised Forest Plan (TLMP Draft Revision 1991a) provides a listing and brief summary of the BMP's used in the Alaska Region. In addition, many other Forest Plan standards and guidelines apply, in addition to those cited in the table. These are incorporated by reference (TLMP Draft Revision 1991a).

Table 2-3
Site-Specific Mitigation Measures Incorporated into Unit and Road Design[1/]

Mitigation Measure	Description	No. of Units Affected in Each Alternative[2/] F2	3	4	F5
Minerals and Caves					
M1	Protect all known mineral improvements, such as mine claim markers, by specifications in timber sale and road construction contracts.	3	6	5	3
M2	Develop and implement site-specific protective measures for cave and karst features containing significant resources.	1	2	2	1
Fish, Water Quality, and Soils					
F1	Modify unit design to avoid very high mass movement areas (BMP 13.5), and areas dominated by McGilvery soils.	20	30	22	16
F2	Avoid road construction in areas of very high mass movement potential resulting in the need for helicopter yarding.	5	14	4	3
F3	Require partial- to full-suspension logging systems in areas with high mass movement potential or McGilvery soils (BMP 13.9).	29	40	18	20
F4	Modify unit design or logging system to avoid or minimize damage to muskegs or other wetlands (BMP's 12.5 and 13.15).	13	14	12	11
F5	Establish no-harvest and selective-cut buffers along streams and around lakes to protect riparian management areas (BMP 12.6). This includes TTRA minimums and additional area as described in the Stream and Lake Protection Management Prescription.	39	41	42	30
F6	Require split-yarding and directional felling along selected Class III streams with no buffers to provide for streambank and stream channel protection (BMP 12.7 and 13.16).	33	44	36	24
F7	Permit no harvest within steep V-notch streams with high erosion potential (BMP 13.16).	8	9	11	6
F8	Implement measures to reduce surface erosion and drainage interruption related to transportation including water barring and cross-draining roads, using ditches and culverts to prevent water running long distances over roads, seeding and fertilizing cut and fill slopes, and locating and designing landings for good drainage and dispersion of water (BMP's 13.10 14.3, 14.5, 14.8, 14.9, 14.11, 14.12, 14.13).	61	73	78	52
F9	Locate creeks that provide water supplies to homes at Cannery Creek and Sunny Cove. Implement erosion control measures and use additional care during road construction to maintain State Water Quality Standards for drinking water.	0	9	3	0
F10	Establish timing restrictions for instream road construction activities to avoid impacts on fish populations (BMP 14.6).	5	19	12	4

1/ Refer to the appropriate section in Chapter 4 for a more complete description of each measure.

2/ Refer to Appendix B for a specific listing of the units affected.

Table 2-3 (continued)

Site-Specific Mitigation Measures Incorporated into Unit and Road Design[1/]

Mitigation Measure	Description	No. of Units Affected in Each Alternative[2/] F2	3	4	F5
F11	Evaluate opportunity for stream barrier removal to increase fish habitat availability.	3	1	2	2
F12	Evaluate opportunity for stream habitat enhancement by addition of large woody debris (LWD).	2	2	1	2
Vegetation and Timber					
T1	Conduct partial harvest by helicopter to maintain yellow-cedar trees in the unit to provide seed and shelter to maintain high yellowcedar composition in future stand.	3	3	2	2
Wildlife					
W1	Provide for greater habitat diversity on a stand level by leaving no-cut islands or fingers of timber (Type D Clearcut).	17	16	16	15
W2	Provide for greater structural diversity on a stand level by partial cutting all of most of the harvest unit.	9	16	6	6
W3	Provide for greater structural diversity on a stand level by leaving nonmerchantable trees and safe snags over the entire harvest unit (Type C Clearcut).	22	28	7	16
W4	Provide for snag retention and greater structural diversity on a stand level by prescribing and contractually requiring a specified number of reserve trees including snags and live tree replacements along the harvest unit edges and internal setting boundaries. Also leave safe-snags and nonmerchantable, reserve trees along harvest unit edges and internal setting boundaries through contractual recommendations (Type B Clearcut).	17	19	18	16
W5	Provide for snag retention and greater structural diversity on a stand level by leaving safe snag and nonmerchantable reserve trees along harvest unit edges and internal setting boundaries through contractual recommendations (Type A Clearcut).	44	53	58	37
W6	Lengthen the productive stage of young growth forests as wildlife habitat and increase structural diversity of young growth forests on a stand level by conducting variable tree spacing precommercial thinning on an experimental basis.	19	20	20	16
W7	Modify unit design to provide 30-acre no-cut buffers around all known marbled murrelet nest sites.	0	3	1	0
W8	Restrict the timing of helicopter logging and/or helicopter flight paths and blasting near bald eagle nest sites when occupied.	4	11	4	4
W9	Conduct goshawk surveys at harvest units in the Old Franks Creek drainage where goshawk presence is suspected and implement Region 10 goshawk management guidelines, as appropriate, if nesting is identified.	7	16	7	6
W10	Implement road closures immediately after harvest to minimize human disturbance to wildlife and road access by hunters in specific areas.	3	27	19	0

Table 2-3 (continued)

Site-Specific Mitigation Measures Incorporated into Unit and Road Design[1/]

Mitigation Measure	Description	No. of Units Affected in Each Alternative[2/] F2	3	4	F5
W11	Evaluate potential for disturbance and restrict harvest and road construction activities in areas and during time periods when Vancouver Canada goosenesting or trumpeter swan wintering might be disturbed.	9	16	10	7
W12	Restrict Forest Service-authorized boat traffic and aircraft flights in the vicinity of the Steller sea lion haulout at Kassan Point on Grindall Island, as per the standards and guidelines described in the TLMP Draft Revision Supplement (1991a).	*	*	*	*
W13	Restrict Forest-Service authorized boat traffic and aircraft flights in the known vicinity of humpback whales and properly dispose of cables from inactive LTF sites, as per the standards and guidelines described in the TLMP Draft Revision Supplement (1991a).	*	*	*	*
Visual Resources					
V1	Modify unit boundaries to allow harvest unit to meet proposed VQO's in partial retention/retention areas.	1	14	7	0
V2	Conduct partial cutting of unit to minimize visual contrast with adjacent areas.	3	12	3	2
V3	Leave behind all nonmerchantable trees after clear-cutting to minimize visual contrast with adjacent areas.	3	2	3	2
V4	Conduct partial cutting along harvest unit and setting boundaries to reduce visual contrast with adjacent areas.	3	6	8	3
V5	Manage views from the proposed recreational developments at the head of Twelvemile Arm by careful siting, maintaining roadside screening and screening of harvest units, and opening views to areas with high scenic quality.	1	5	5	1
Recreation					
R1	Avoid harvesting or use partial cutting in the immediate vicinity of One Duck Lake, trail, and shelter to minimize effects on the recreational experience.	1	2	0	1
R2	Provide for public access, parking, and sufficient turn-outs and signage for safety along logging roads near an unnamed lake east of Polk Inlet.	2	0	2	2
R3	Provide for public access, parking, trails, sufficient turn-outs and signage for safety, and road closures to control road and foot recreation access to lakes in the Old Franks drainage.	0	1	1	0
R4	Require all road construction slash and debris from right-of-way (ROW) clearing along roads to be used for recreational access, to be buried in the road prism or hauled to a designated disposal area.	2	1	3	2
Cultural Resources					
C1	Provide for mitigation of indirect effects to cultural resource sites near proposed harvest units and roads.	1	0	2	0

* These measures potentially affect all harvest units.

Monitoring Plan

Monitoring activities can be divided into three broad categories: Forest Plan monitoring, routine implementation monitoring, and project-specific monitoring. These broad types are discussed in the following sections.

Forest Plan Monitoring

The National Forest Management Act requires that National Forests monitor and evaluate their forest plans (36 CFR 219.11). The significance of this requirement is emphasized by the recent development of a National Monitoring and Evaluation Strategy (Forest Service 1993). The Strategy is designed to focus agency attention and resources on evaluating implementation of forest plans to provide the Forest Service with information necessary to ensure responsive and efficient management of National forests. Embodied in the National Monitoring and Evaluation Strategy are three principles: (1) evaluation of results will be readily available to the public, agencies, and other groups; (2) monitoring and evaluation will focus on ecosystems and emphasize interrelationships among biotic and abiotic components; and (3) the strategy will be flexible to meet local needs while encompassing forest, regional, and national requirements.

Three levels of monitoring are incorporated into Forest Plan monitoring and evaluation:

Implementation Monitoring is used to determine if goals, objectives, standards and guidelines, and management prescriptions are implemented as detailed in the Forest Plan and project specifications;

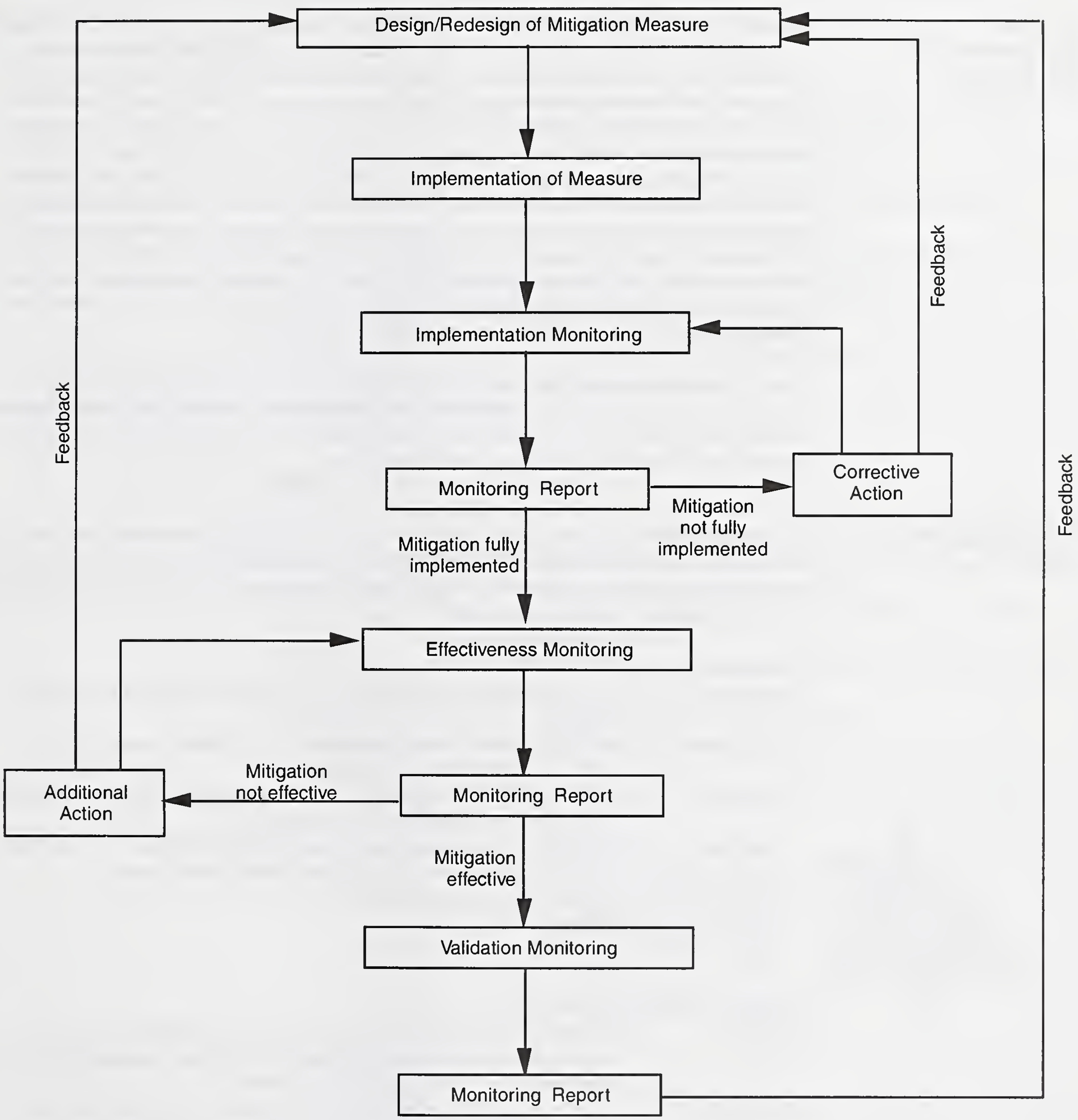
Effectiveness Monitoring is used to determine if standards and guidelines and management prescriptions as designed and implemented are effective in meeting Forest Plan goals and objectives; and

Validation Monitoring is used to determine whether the data, assumptions, and coefficients used in the development of the Plan are correct.

Most monitoring elements involve the mitigation measures described previously. The mitigation measures are part of a process that includes these three types of monitoring to determine if the measure was implemented and is effective or needs revision. The feedback provided by monitoring results can be used to develop improved methods or additional treatments to ensure that the mitigation will be effective in the future. Figure 2-7 displays how this process of mitigation and monitoring occurs.

An annual monitoring report will be prepared by each Administrative Area of the Tongass and incorporated into one Tongass report at the end of each year beginning with Fiscal Year 1993. The Ketchikan Area submitted its 1993 Plan to the Regional Forester in December 1993. In early 1994 the Ketchikan Area adopted a Monitoring Strategy to more specifically guide area monitoring effects. Results of this more intensive coordinated effort will be included in the 1994 Fiscal Year Monitoring and Evaluation Report. This report will address all monitoring questions contained in the applicable Forest Plan; reference all monitoring being conducted on the Area/Forest; assess progress towards achieving the goals and objectives described in the Forest Plan; and either certify that the Forest Plan is sufficient to guide management of the forest over the next year or propose needed changes and an approach for dealing with those changes.

Figure 2-7
Mitigation/Monitoring Feedback Loop



Forest Plan monitoring is conducted over the entire forest on a sample basis. Samples may or may not be taken within the Polk Inlet Project Area; however, monitoring results are designed to answer questions regarding the implementation and effectiveness of mitigation within the Project Area. A total of 38 implementation, effectiveness, and validation monitoring items are identified in the forest-wide monitoring plan described in the TLMP Draft Revision (1991a).

Routine Implementation Monitoring

Routine implementation monitoring assesses whether the project was implemented as designed and whether or not it complies with the Forest Plan. Planning for routine implementation monitoring began with the preliminary design of harvest units and roads. Specialists used on-the-ground inventories, computer inventories, and aerial photographs to prepare documents called unit cards for each harvest unit in each of the alternatives. Cards were also prepared for each segment of road. Resource specialists wrote their concerns on the cards and then described how the concerns could be addressed in the design of each unit and road segment. Integrated silvicultural prescriptions were prepared to describe the detailed interdisciplinary prescription for each unit. Resource concerns, mitigation measures, and prescriptions will be refined further during final layout when specialists will have one more opportunity to revise the unit and road card recommendations and integrated silvicultural prescriptions. The unit and road cards and prescriptions will be the basis for determining whether recommendations were implemented for various aspects of the Polk Inlet Project.

Routine implementation monitoring is part of the administration of a timber sale contract. The sale administrators and road inspectors ensure that the recommendations contained on the unit and road cards and the prescriptions are incorporated into contract documents and then monitor performance relative to contract requirements.

Project-specific Monitoring

In addition to the Forest Plan monitoring and routine implementation monitoring that will be conducted throughout the Tongass National Forest, including the Polk Inlet Project Area, two Project-specific monitoring activities are identified. The following provides a description for each Project-specific monitoring activity.

Marbled Murrelet

Objective:	To determine if nest-site buffers are effective at maintaining nest site viability.
Desired result:	Marbled murrelet nesting continues to occur within 30-acre nest-site buffers established at three sites.
Measurement:	Dawn surveys following protocol to identify nesting activity and ground-checking of buffers to verify windfirmness.
Evaluation:	Determine if buffers are largely intact and if murrelet use is occurring.
Responsible staff:	Craig Ranger District or Supervisor's Office wildlife staff.
Record of results:	Prepare a brief report of results.
Annual cost:	$5,000.
Personnel needs:	0.1 FTE.

Ecosystem Management

Objective:	To determine if the four types of clearcuts, with reserve trees, and partial cuts, prescribed in this project for ecosystem management, have been implemented and appear to be effective.
Desired Result:	All four types of clearcuts and partial cuts have been implemented and each type appears effective, to varying degrees, at maintaining snag densities and structure in the second-growth stand and at reducing the visual contrast between the clearcut and adjacent old growth.

Measurement:	Compare unit cards and silvicultural prescriptions with observations on the ground on 20 percent of the units. Prepare narrative description and map of reserve tree size, density, and distribution.
Evaluation:	Modify future unit prescriptions based on feedback obtained.
Responsible Staff:	Craig Ranger District or Supervisor's Office wildlife staff and landscape architect
Record of Results:	Prepare a brief report of results.
Annual Cost:	$9,000.
Personnel Needs:	0.3 FTE

Old Franks Creek

Objective:	To provide data that provides an assessment of the watershed analysis results and allows refinement of the watershed analysis procedures conducted for the Old Franks Creek watershed.
Desired Result:	To develop a field data collection procedure and a literature review that aids in the refinement of the watershed analysis based on observed watershed-specific implementation and effects.
Measurement:	The procedure would consider implementation and resulting effects to all parameters evaluated in the watershed analysis.
Evaluation:	Determine if evaluated watershed analysis parameters provide meaningful criteria to evaluate watersheds.
Responsible Staff:	Supervisor's Office watershed and fisheries staff.
Record of Results:	Prepare a brief report of results.
Annual Costs:	$15,000.
Personnel Costs:	0.5 FTE.

Indian Creek

Objective:	To provide data that is comparable with the available pre-harvest Indian Creek data. The available information provides an opportunity to do implementation, effectiveness, and validation monitoring.
Desired Result:	Water quality parameters within State standards.
Measurement:	Water temperature, turbidity, and the percent accumulation of fine sediments in stream gravels.
Evaluation:	Determine post-harvest water quality parameters in relationship to State standards.
Responsible Staff:	Supervisor's Office watershed and fisheries staff.
Record of Results:	Prepare a brief report of results.
Annual Costs:	$6,000.
Personnel Costs:	0.2 FTE.

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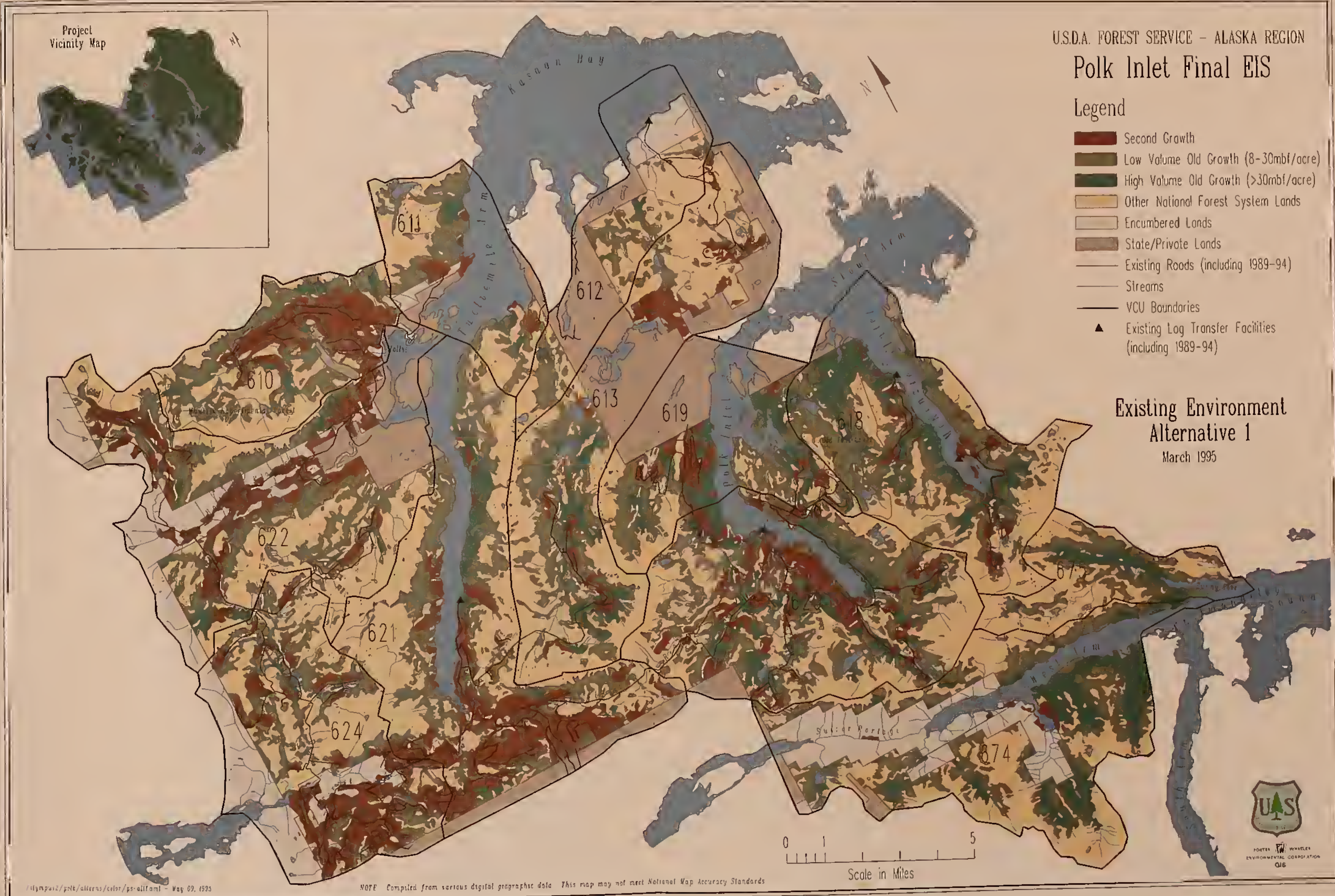
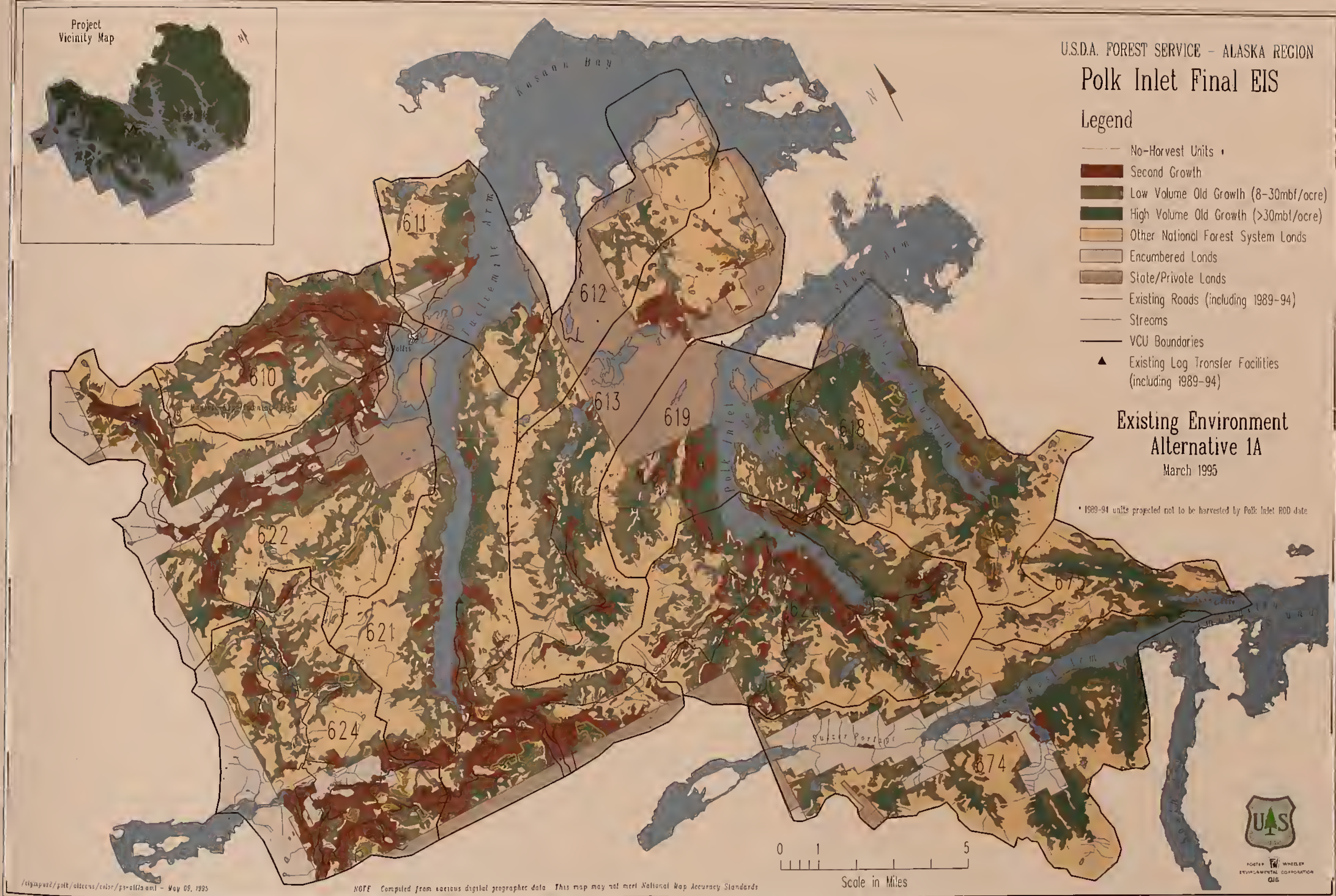
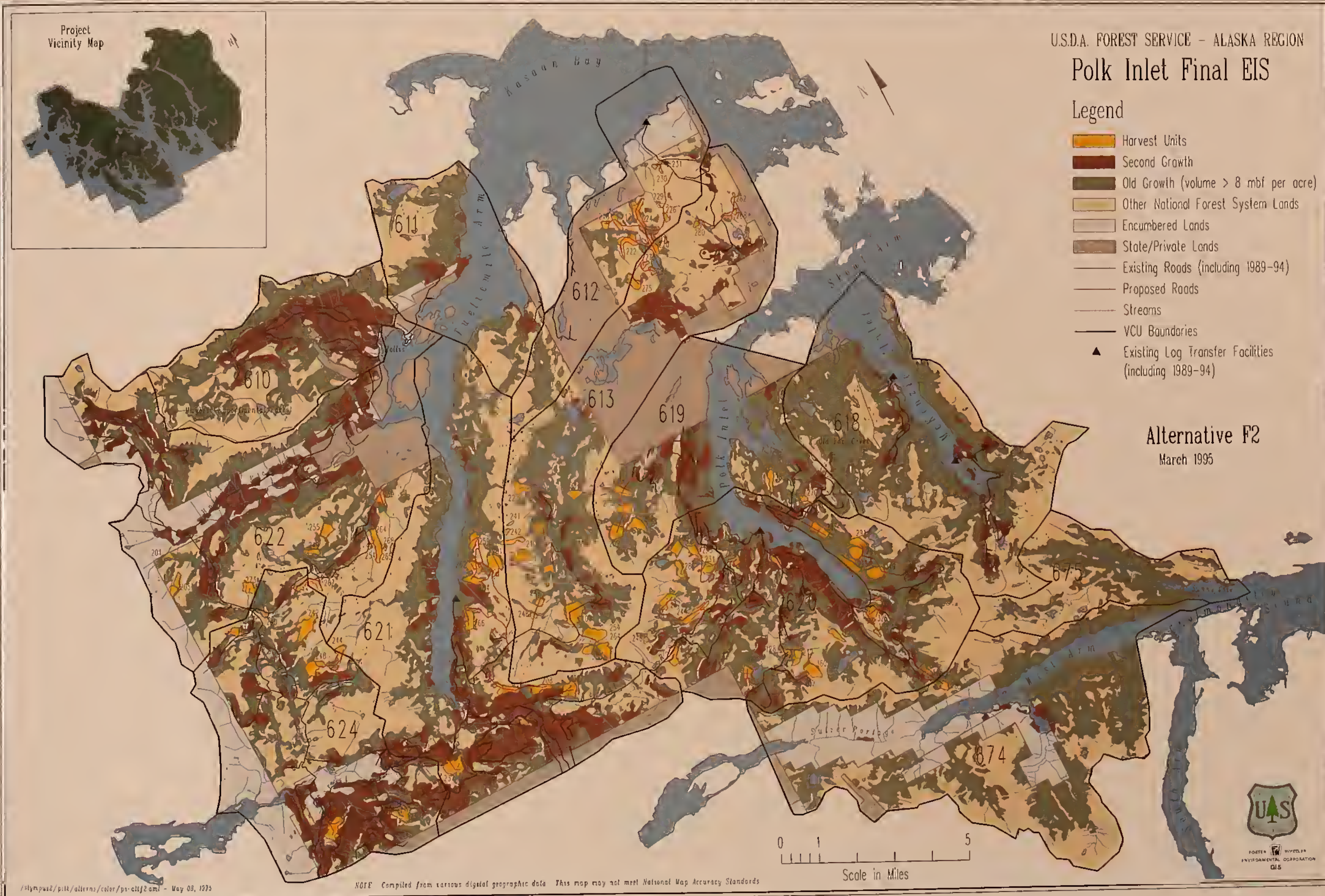
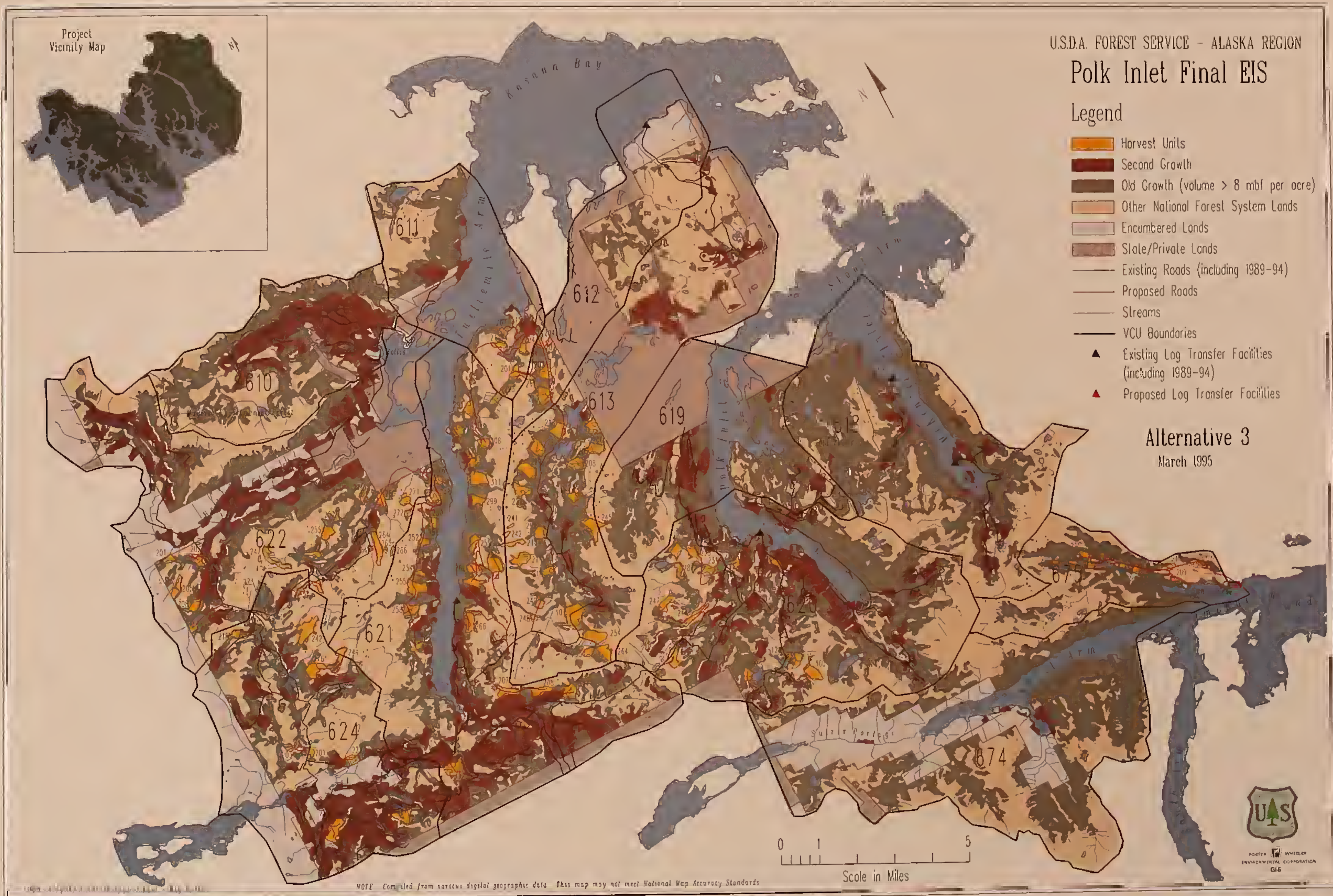


U.S.D.A. FOREST SERVICE - ALASKA REGION
Polk Inlet Final EIS
Legend
Second Growth
Low Volume Old Growth (8-30mbf/acre)
High Volume Old Growth (>30mbf/acre)
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Existing Roads (including 1989-94)
Streams
VCU Boundaries
Existing Log Transfer Facilities (including 1989-94)
Existing Environment
Alternative 1
March 1995
Project Vicinity Map
Kasaan Bay
Polk Inlet
610
611
612
613
618
619
621
622
624
674
N
0 1 5
Scale in Miles
NOTE Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards

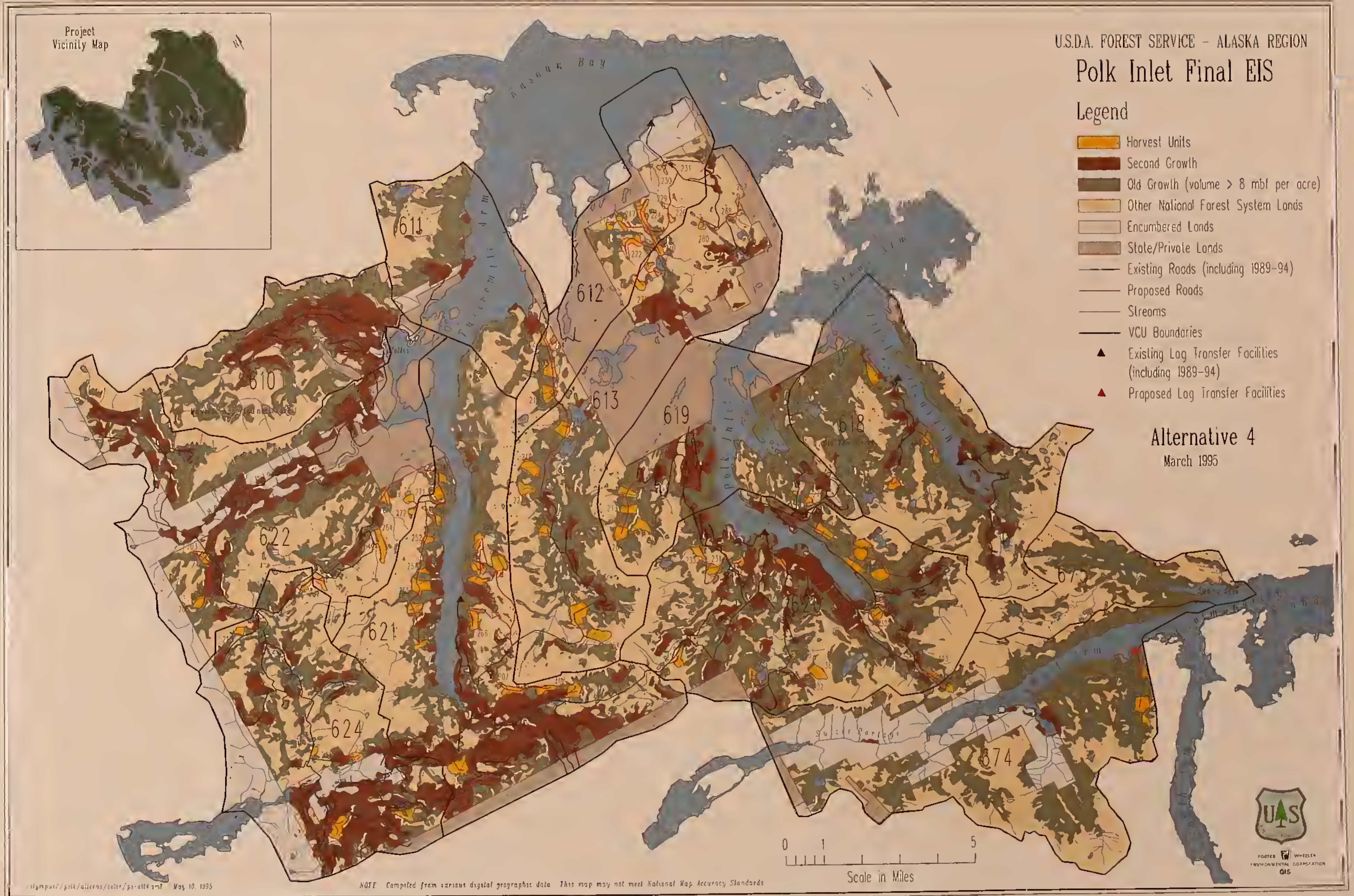

Project Vicinity Map
U.S.D.A. FOREST SERVICE - ALASKA REGION
Polk Inlet Final EIS
Legend
No-Harvest Units •
Second Growth
Low Volume Old Growth (8-30mbf/acre)
High Volume Old Growth (>30mbf/acre)
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Existing Roads (including 1989-94)
Streams
VCU Boundaries
Existing Log Transfer Facilities (including 1989-94)
Existing Environment
Alternative 1A
March 1995
• 1989-94 units projected not to be harvested by Polk Inlet ROD date
Kasaan Bay
Twelvemile Arm
Polk Inlet
Skowl Arm
West Arm
Sulzer Portage
610
611
612
613
618
619
621
622
624
674
675
0 1 5
Scale in Miles
NOTE Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards
FOSTER WHEELER ENVIRONMENTAL CORPORATION GIS



Project Vicinity Map
U.S.D.A. FOREST SERVICE - ALASKA REGION
Polk Inlet Final EIS
Legend
Harvest Units
Second Growth
Old Growth (volume > 8 mbf per acre)
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Existing Roads (including 1989-94)
Proposed Roads
Streams
VCU Boundaries
Existing Log Transfer Facilities (including 1989-94)
Alternative F2
March 1995
Kasaan Bay
Twelvemile Arm
Polk Inlet
Skowl Arm
McKenzie Inlet
Sulzer Portage
Cholmondeley Sound
West Arm
611
612
613
619
618
610
622
621
620
624
675
674
0 1 5
Scale in Miles
NOTE Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards
FOSTER WHEELER ENVIRONMENTAL CORPORATION GIS



U.S.D.A. FOREST SERVICE - ALASKA REGION
Polk Inlet Final EIS
Legend
Harvest Units
Second Growth
Old Growth (volume > 8 mbf per acre)
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Existing Roads (including 1989-94)
Proposed Roads
Streams
VCU Boundaries
Existing Log Transfer Facilities (including 1989-94)
Proposed Log Transfer Facilities
Alternative 3
March 1995
Project Vicinity Map
Kasaan Bay
611
612
613
619
610
622
621
624
620
674
Scale in Miles
0 1 5
NOTE Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards



Project Vicinity Map
U.S.D.A. FOREST SERVICE - ALASKA REGION
Polk Inlet Final EIS
Legend
Harvest Units
Second Growth
Old Growth (volume > 8 mbf per acre)
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Existing Roads (including 1989-94)
Proposed Roads
Streams
VCU Boundaries
Existing Log Transfer Facilities (including 1989-94)
Proposed Log Transfer Facilities
Alternative 4
March 1995
Kasaan Bay
Polk Inlet
611
612
613
619
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610
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621
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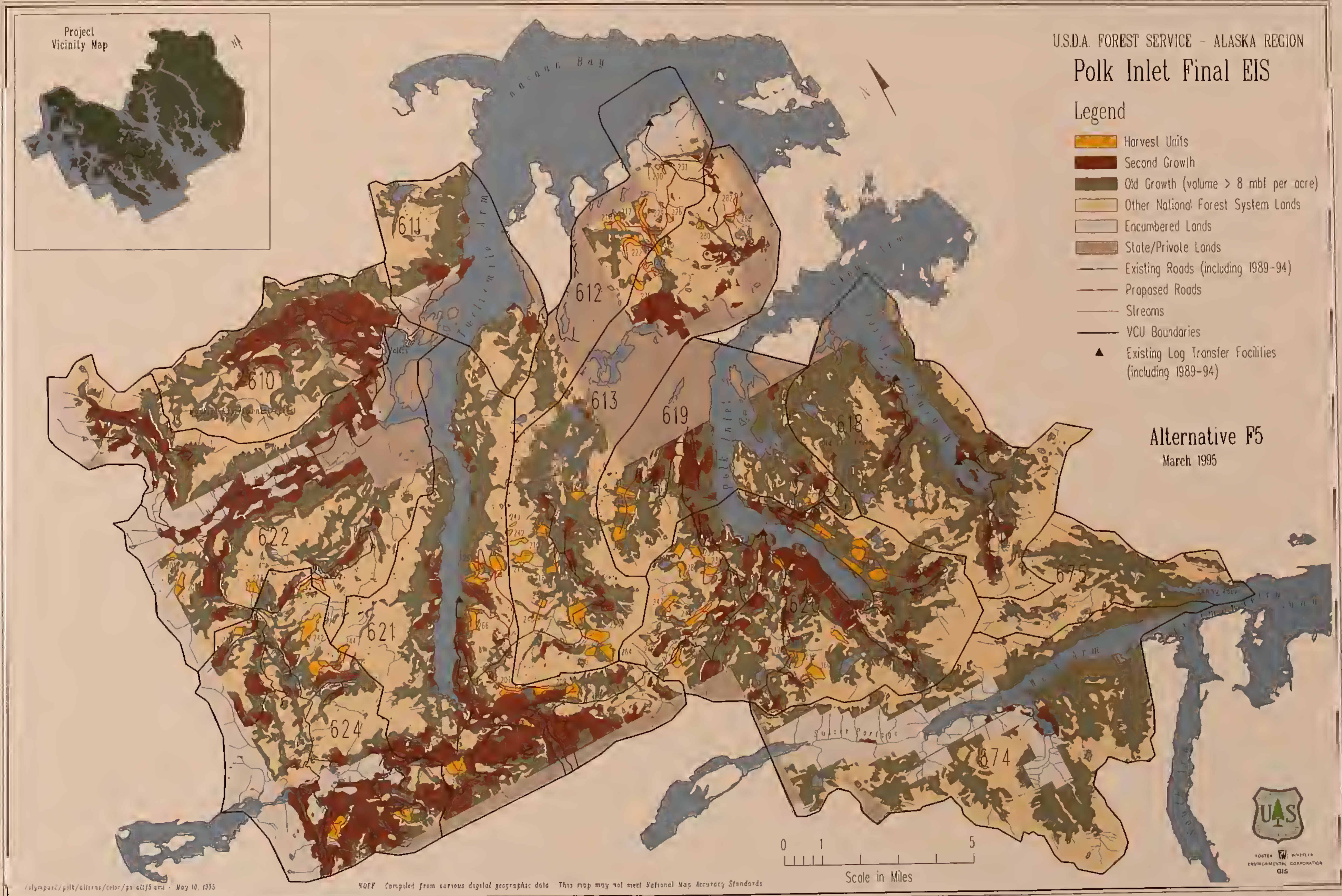
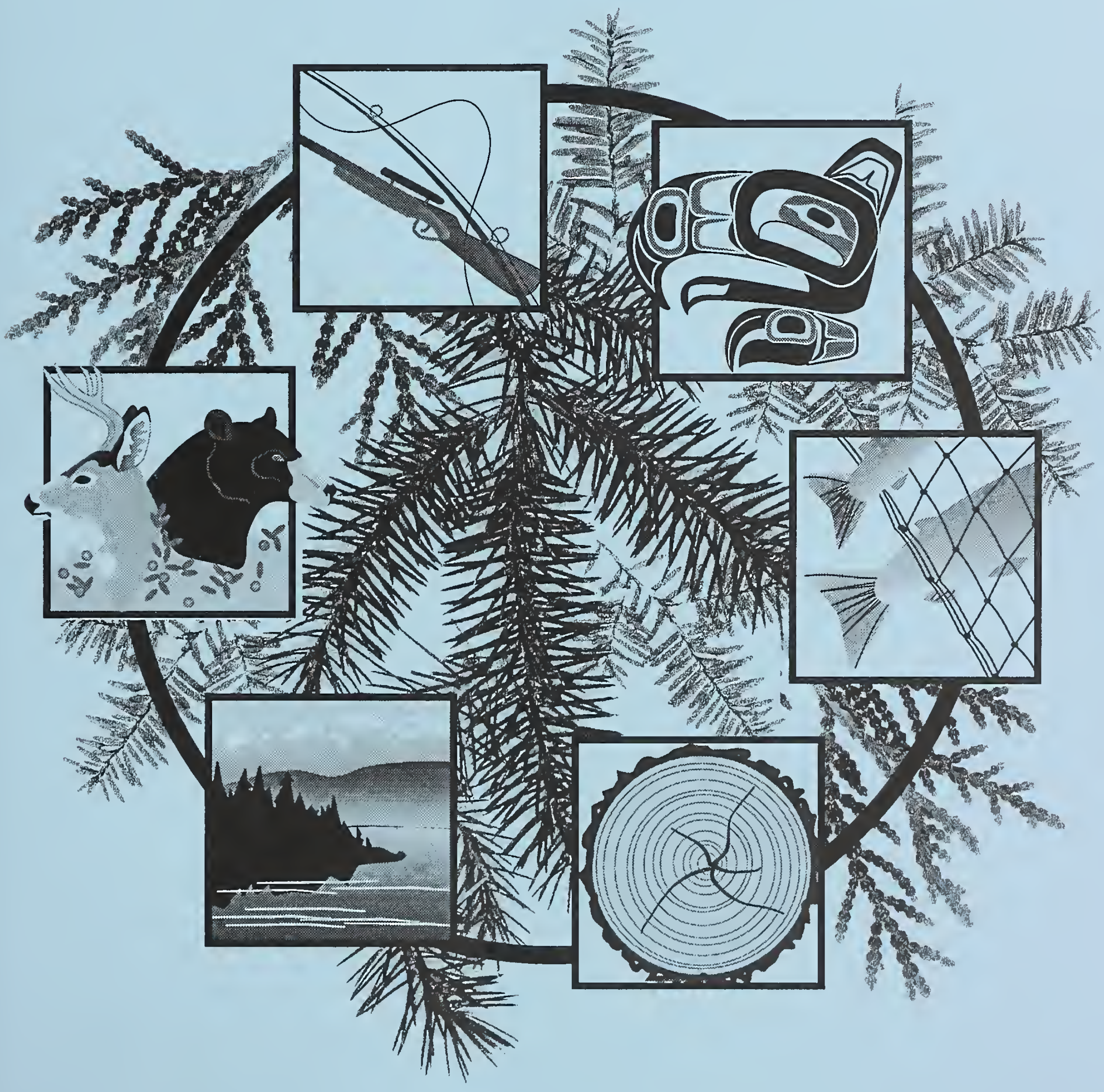
Scale in Miles
NOTE Compiled from various digital geographic data This map may not meet National Map Accuracy Standards
FOSTER WHEELER ENVIRONMENTAL CORPORATION GIS



Project Vicinity Map
U.S.D.A. FOREST SERVICE - ALASKA REGION
Polk Inlet Final EIS
Legend
Harvest Units
Second Growth
Old Growth (volume > 8 mbf per acre)
Other National Forest System Lands
Encumbered Lands
State/Private Lands
Existing Roads (including 1989-94)
Proposed Roads
Streams
VCU Boundaries
Existing Log Transfer Facilities (including 1989-94)
Alternative F5
March 1995
611
612
610
613
619
618
622
621
675
624
674
Polk Inlet
Twelvemile Arm
Kasaan Bay
Sulzer Portage
0 1 5
Scale in Miles
NOTE Compiled from various digital geographic data. This map may not meet National Map Accuracy Standards
FOSTER WHEELER ENVIRONMENTAL CORPORATION GIS

Chapter 3

Affected Environment



Chapter 3

Affected Environment

Introduction

This chapter provides information concerning the existing environment of the Polk Inlet Project Area that might be affected by implementation of the action alternatives. It describes the baseline conditions against which environmental effects can be evaluated and from which progress toward the desired future condition of the resource, trends related to its status, and relevant characteristics that might be affected by the alternatives. The following resources are discussed:

Climate and Air Quality
Geology, Minerals, and Caves
Soils
Wetlands, Floodplains, and Riparian Areas
Water, Fish, and Fisheries
Vegetation and Timber Resources
Wildlife
Threatened, Endangered, and Sensitive Species
Biodiversity
Lands
Transportation and Facilities
Economic and Social Environment
Subsistence
Cultural Resources
Visual Resources
Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Area.

Chapter 4 discusses the effects of the proposed alternatives on these same resources and in this same sequence.

Available Information

There is less than complete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs, and communities. The ecology, inventory, and management of a large forest area is a complex and developing science. The biology of wildlife species prompts questions about population dynamics and habitat relationships. The interaction of resource supply, the economy, and communities is the subject matter of an inexact science.

In developing Chapters 3 and 4 of this EIS, the interdisciplinary team (IDT) examined the data and relationships used to estimate the effects of the alternatives. The data and level of analysis used were commensurate with the importance of the possible impacts (40 CFR 1502.15); and

relevant discussion in the TLMP (1979a, as amended) and the TLMP Draft Revision (1991a) is incorporated by reference (40 CFR 1502.21).

When encountering a gap in information, the IDT concluded that the missing information frequently would have added precision to estimates or better specified a relationship. However, the basic data and central relationships are sufficiently well established in the respective sciences that the new information would be very unlikely to reverse or nullify understood relationships. Thus, new information would be welcomed and would add precision, but it was not essential to provide adequate information for each alternative such that the decision-maker can make a reasoned choice.

Land Divisions

The area of the Tongass National Forest has been divided in several ways to describe the different resources and allow analysis of how they might be affected by Forest Plan and project-level decisions. These divisions vary by resource since the relationship of each resource to geographic conditions and zones also varies. Four land divisions that are used for more than one resource are described below.

Geographic Provinces

These are seven large land areas that are distinguished by differences in ecological processes. They are defined by a combination of climatic and geographic features and vegetation. Geographic provinces are used in the *Biodiversity* and *Wildlife* sections.

Management Areas

The 1979 Forest Plan (TLMP 1979a, as amended) divided the Tongass into 141 management areas (MA's), two of which are in the Polk Inlet Project Area (K17 and K18) (see Figure 1-5). Each MA has area-specific direction and activity schedules. The Tongass Timber Reform Act (TTRA) directed that "proportionality" (see the *Vegetation and Timber Resources* section of this Chapter) be analyzed using the MA's. The 141 areas, therefore, are preserved in this analysis and are used to ensure that the proportionality requirement is met. (See TLMP Draft Revision, Chapter 5, for a detailed analysis [TLMP 1991a].)

Value Comparison Units (VCU's)

These are distinct geographic areas, each encompassing a drainage basin containing one or more large stream systems. The boundaries usually follow watershed divides. The Tongass contains 867 VCU's; 12 are found in the Polk Inlet Project Area (VCU's 610 through 613, 618 through 622, 624, 674, and 675) (see Figure 1-5). They are used to describe the locations of specific resources in the Project Area.

Wildlife Analysis Area (WAA's)

These are Forest Service land divisions that correspond to Minor Harvest Areas used by the Alaska Department of Fish and Game. Approximately 190 apply to the Tongass and all or part of 5 (1107, 1213, 1214, 1317, 1332) to the Polk Inlet Project Area. They are used in the *Subsistence*; *Water, Fish, and Fisheries*; and *Wildlife* sections.

Geographic Information System

Tongass National Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in the analysis of these data. Much of the data consists of electronic "map layers," each representing a particular resource or attribute (i.e., vegetation types, soil types, recreation places). Specific information gathered for the Polk Inlet Project was added to the Forest information already contained in the system to generate spatial analyses of alternatives and effects. GIS plots displaying resource data in map format and tables based on electronically measured areas and lengths are found throughout this EIS.

General Project Information

The Polk Inlet Project Area encompasses a large part of the central portion of Prince of Wales Island (see Figure 1-1). The area includes diverse terrain from inlets, bays, and beach fringes to alpine slopes and ridges. A variety of land forms and vegetative communities exists between the two elevational extremes. Eighty percent of the Project Area land is forested with a majority of the forest land classified as old growth. The most prolific conifer species found in the area are western hemlock and Sitka spruce. Water is a major component of the landscape from the long fjords to drainages dissecting slopes of varying steepness and complexity. Muskegs and lakes, both large and small, are found across the Project Area.

The forests, shorelines, streams, and rivers of Southeast Alaska provide habitat for over 300 species of birds and mammals. Management Indicator Species (MIS) in the Project Area include the Sitka black-tailed deer, black bear, river otter, marten, gray wolf, Vancouver Canada goose, bald eagle, red-breasted sapsucker, hairy woodpecker, and brown creeper. Anadromous and resident fish occupying Project Area streams are important to sport, commercial, and subsistence users throughout Southeast Alaska. Coho and pink salmon are the MIS that represent anadromous fish, and Dolly Varden char represents resident fish for the Polk Inlet Project Area.

The largest community in the Project Area is unincorporated Hollis on the east side of the island. Hollis is also the site of the only Alaska Marine Highway ferry terminal on Prince of Wales Island. Hollis is connected by a paved road to the larger communities of Klawock and Craig on the west side of the island.

3 Affected Environment

Climate and Air Quality

Key Terms

Ambient air—that air, external to building, encompassing or surrounding a specific region.
Ambient air quality standard—the prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.
Class I airshed—one of three classes of areas provided for in the Clean Air Act for the Prevention of Significant Deterioration program. Class I airsheds are the "cleanest" and receive special visibility protection.
Class II airshed—the second of three classes of areas provided for in the Clean Air Act. Class II airsheds have no specific attainment criteria.

Climate

The climate of the Polk Inlet area is moderated by the maritime influences of the Pacific Ocean. In the summer, this provides a cooling influence, while in winter temperatures are warmer than would be expected for these latitudes. Normal temperatures range from the mid-40's to the mid-60's in summer, and from the high teens to the low 40's in the winter. During the warmer months, temperatures are highest inland and lowest along the coast, while in the colder months, the reverse is true.

The north Pacific Ocean also generates low pressure weather systems which move onshore and produce abundant cloud cover. These low pressure systems also dominate the wind patterns. Table 3-1 displays the number of days, by month, when strong winds occurred between 1953 and 1978. Over 80 percent of the gale force winds reported in this time interval were from the south or southeast. Gale force winds occur during every month of the year but the vast majority occur during the fall and winter months.

The Project Area has complete cloud cover about 85 percent of the year. These clouds inundate the area with precipitation. In the Project Area, mean annual precipitation increases from the northeast to the southwest from about 90 to 110 inches (James 1956). October is generally the wettest month. High precipitation persists through the middle of November when intermittent snowfall occurs. Snowfall varies according to elevation and distance inland from the coast. Snow accumulation below 500 feet elevation is short-lived, generally melting off within a few days due to warmer temperatures and rain.

Table 3-2 shows mean annual summer and winter temperatures, precipitation, and snowfall for the portion of Prince of Wales Island that includes the Polk Inlet Project Area.

Air Quality

Because of the relatively pristine nature of Southeast Alaska, there is a general lack of ambient air monitoring data to characterize undeveloped areas. There is some ambient monitoring near a few of the large air emissions sources, such as pulp mills. However, those data are not representative of the area as a whole. The air flow from the Gulf of Alaska is not tainted by industrial air pollution and can be expected to meet all standards for protection of public health and welfare, in the absence of specific data to the contrary. Local sources of airborne particulates include motor vehicle emissions, motor vessels and cruiseships, dust, residential and commercial heating sources, marine traffic, the Ketchikan Pulp Company mill at Ward Cove, and a limited amount of prescribed burning.

Table 3-1

Number of Days, by Month, With Winds[1/] Over 30 Miles per Hour, National Oceanographic and Atmospheric Administration (NOAA) Meteorological Station at Annete Island, Alaska, 1953-78

	Miles per Hour						Total
Month	31-35	36-40	41-45	46-50	51-55	56-60	Days
July	3						3
August	5	4					9
September	11	7	3		1		22
October	67	45	13	4	3		132
November	58	41	5	8	1		113
December	64	39	9	9	2	3	126
January	70	29	5	6	2	2	114
February	60	31	2	8			101
March	25	9	8	4			46
April	32	9	7	2			50
May	8	5	2				15
June	11	1	1				13

SOURCE: Harris 1989.

1/ Daily fastest mile wind speed is obtained by measuring and averaging instantaneous wind velocities over 1 minute once each hour. The highest of all the 24 hourly measurements for the day is called the fastest mile and is included in published reports.

Table 3-2

Mean Yearly Summer and Winter Temperatures, Precipitation, and Snow Accumulation for Two Communities on Prince of Wales Island

Recording Station	Mean Summer Temperature (°F)	Mean Winter Temperature (°F)	Mean Precipitation (inches)	Mean Snow (inches)
Craig	55.0	34.8	106.47	35.7
Hollis	56.6	33.7	109.69	17.0

SOURCE: Alaska Climate Center Technical Note No. 3, 1986.

Vehicles and home heating, particularly wood-fired heating, contribute to regional particulate matter concentrations. Alaska has experienced localized problems with wood smoke, and has issued regulations that limit open burning and other air pollution-generating activities in wood smoke control areas between November 1 and March 31. The wood smoke control areas do not include the Polk Inlet Project Area. Open burning may be restricted in the Project Area when an air quality advisory is issued by the Alaska Department of Environmental Conservation (ADEC) (AAC 50.030). The ADEC has the primary responsibility for attaining and maintaining State and national ambient air quality standards in the Project Area. The Forest Service cooperates with the Alaska agency to protect air quality in National Forests. The entire area is a designated Class II airshed for purposes of Prevention of Significant Deterioration. This designation allows moderate industrial air pollution concentration increases, compared to the more restrictive requirements of Class I airsheds.

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Geology, Minerals, and Caves

Key Terms

Carbonate rock—rocks such as limestone and dolomite which contain a high content of calcium carbonate, $CaCO_3$.
Cave resources—any material or substance occurring in caves on Federal lands, such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens, and speleothems.
Cave—any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.
Sinkhole—relatively shallow, bowl- or funnel-shaped depressions ranging in diameter from a few to more than 3,000 feet.
Glacial till—gravel, boulders, sand and finer materials transported and deposited by a glacier.
Graywacke—fine-grained, sedimentary rock made up of fragments of slate or schist.
Igneous rock—formed by the cooling and consolidation of magma (lava).
Karst—a type of topography that develops in areas underlain by soluble rocks, primarily limestones.
Lithology—the science dealing with the mineral composition and structure of rocks.
Metamorphic rock—rock whose original compounds, textures, or both have been transformed to new compounds or textures as a result of high pressure, temperature, or both.
Phyllite—a slaty rock with lustrous surfaces due to the high content of mica flakes.
Pleistocene—the epoch forming the first half of the Quaternary period, originating about two million years ago.
Sedimentary rock—formed by chemical precipitation or sedimentation of mineral grains deposited by water, wind, or ice.

Introduction

The geology of the Polk Inlet Project Area influences all physical and biological characteristics. The geological characteristics are described by the geomorphology, lithology, minerals, and cave resources of the Project Area.

Geomorphology

The Polk Inlet Project Area is characterized by rugged mountain groups of low to moderate relief with altitudes reaching over 3,000 feet. The mountains are separated by valleys and fjords that have been oversteepened by past glacial erosion. Sections of the valley walls and fjords may be near vertical to vertical and can fail in rockslides. Less steep sidewalls are often covered with glacial till; these surficial sediments may fail as landslides. In the lower valleys, stream-deposited sediment predominates. Where larger streams enter the sea, tidal action forms estuaries from the stream-transported sediment. The lower sideslopes and valley floors provide excellent sites for the growth of commercial tree species. The steep valley sides can make road access difficult.

Geology

The lithology or bedrock geology of the Polk Inlet Project Area consists of a variety of sedimentary, igneous, and metamorphic rocks. Intrusive igneous rocks are common east of McKenzie Inlet and locally at Sunny Cove. The southern part of the Project Area is underlain by metamorphic rocks with small amounts of limestone and slate. The central and western parts are underlain by sedimentary and volcanic rocks. A band of limestone bedrock extends east to west south of Twelvemile Inlet, and is intersected by the upper parts of Cave, Twelvemile, and Beaver creeks. A large mass of marble bedrock forms the uplands to the west of Cannery Creek.

Minerals

Mineralization is widespread in the Project Area. It is associated with intrusive igneous rocks, adjacent metamorphic zones, and hydrothermal replacement processes. Gold, silver, lead, zinc, and copper are the main metals sought in the Project Area, while other commodities including molybdenum, thorium, chromium, and iron, are present to a lesser extent (Condon 1961, Eberlein et al. 1983). Gold occurs combined with sulfides or as free gold. Placer deposits are local and insignificant (Condon 1961). Silver, lead, and zinc are not abundant; however, some of these deposits have been found in the Dolomi-Cholmondeley area. Iron deposits occur locally, primarily in local zones of contact metamorphism. Minerals are considered below in three groups: locatable, leasable, and saleable.

Locatable Minerals

A locatable mineral is any mineral which is "valuable" in the usual economic sense or has a property that gives it distinct and special value. Numerous prospects and former mines in which gold, silver, lead, zinc, and copper are sought occur within the Project Area. The Dawson, Puyallup, and Lucky Nell mines were active between 1900 and 1948 and the Dawson ore mine system was recently explored (ADNR 1988). The Dawson and Puyallup mines are located near Hollis. The Lucky Nell Mine is located in the Twentymile River valley. The Kiam mines southwest of the head of McKenzie Inlet was also active in the early part of the century. Mineral exploration has also occurred to the south of the Harris River near Indian Creek (ADNR 1988).

The Green Monster Mountain prospects occur on private land southwest of the head of Cholmondeley Sound. This site has produced museum-quality epidote crystals (Herreid et al. 1978). The patented Green Monster claims are currently being systematically developed by their owners and remain closed to trespass. Several hundred individual claims, both active and inactive, exist in the Project Area. During field investigation of harvest units and roads, markers for only two claims were observed. Claimant information and location are contained in the Polk Inlet Minerals and Geology Resource Report (Stewart and Jackson 1993).

Leasable Minerals

Federally owned leasable minerals include oil, gas, coal, geothermal resources, potassium, phosphates, and sulfur. There are no known sites with potential for energy mineral development within or near the Project Area. No potentially usable geothermal areas are known to exist within the Project Area.

Salable Minerals

Salable or common variety minerals include sand, rock, building stone, gravel, and similar materials. While no aggregate sources for general commercial utilization have been mapped within the Project Area, potential exists for aggregate resource development. Aggregate has been used extensively for road construction. To date, most of this aggregate has been obtained through blasting bedrock and crushing it to the appropriate size. During field verification for the Polk Inlet Project, road engineers identified numerous potential aggregate sites, which are documented in field notes, road design cards, and in the Logging System and Transportation Plan (Mehrwein et al. 1993).

Cave Resources

Carbonate rocks such as limestone and marble dissolve in slightly acidic natural waters and, under the proper conditions, cave systems are formed. In places, extensive solution can lead to the formation of distinctive surface topography such as sinkholes. When such features dominate the landscape, it can be referred to as karst topography or karst. Karst and related caves are very common on Prince of Wales Island, especially on the northern and northwestern parts of the island (Baichtal 1991). In the Project Area, carbonates are present in varying degrees of purity and are commonly interbedded with greywacke and siltstone. Most outcrops show some degree of metamorphism and, in places, intense metamorphism and complete recrystallization to marble have occurred. This impurity and metamorphism suggest karst topography is minor in the Project Area compared to elsewhere on the island. Herreid et al. (1978) report numerous solution pits in the upland to the west of Big Creek and minor solution weathering along the south shore of Cholmondeley Sound. Minor karst topography exists within the Cave Creek drainage to the southwest of Twelvemile Arm. No information exists on any effects of past management activities on cave resources in the Project Area.

During project field work, karst or cave features were observed in potential harvest units in VCU's 624, 674, and 675. Additionally, sinkholes were observed along the west side of Cannery Creek in VCU 674 at the base of a massive cliff. The site is near the fault contact between marble and volcanic rock (Herreid et al. 1978).

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Soils

Key Terms

Alluvium—stream-deposited sediment.
Colluvium—a deposit of sediment on a hillslope derived from mass movement (landslide processes).
Duff—vegetative material covering the mineral soils in forests, including the fresh litter and decomposed organic material.
Glacial till—gravel, boulders, sand, and finer materials transported and deposited by a glacier.
Mass Movement Index (MMI)—rating used to group soil map units that have similar properties with respect to the stability of natural slopes.
Mass movement—general term for a variety of processes by which large masses of earth material are moved downslope by gravity either slowly or quickly.
McGilvery soil—a shallow, forested, organic soil developed over bedrock.
Muck—decomposed plant material, with little evidence of the original plant remaining.
Muskeg (peatland)—a type of bog that has developed in depressions, or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses, and sedges.
Outwash—alluvium deposited by streams originating from glaciers.
Riparian areas—geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.
Riparian ecosystems—a transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.
Riparian management area—the area including water, land, and plants adjacent to perennial streams, lakes, and other bodies of water that is managed for the inherent qualities of the riparian ecosystem.
Sediment—solid materials, in suspension or transported by water, gravity, ice, or air.
Slip plane—surfaces along which differential movement takes place in soil or rock.
Soil productivity—capacity of a soil to produce plant growth, due to the soil's inherent chemical, physical, and biological properties.
Till—gravel, boulders, sand, and finer materials transported and deposited by a glacier.
V-notch—a shallow to deeply cut stream drainage, generally in steep, mountainous terrain; would look like a "V" from a frontal view.

Introduction

The soil forms a fundamental basis for the terrestrial ecosystem in Southeast Alaska. Its chemical and physical properties strongly influence the vegetation type that forms on its surface. The soil's integrity and stability determine the long-term productivity of the forest. Soil characteristics are strongly influenced by the region's cool growing season temperatures and high rainfall. Under these conditions, organic matter decomposes slowly and tends to accumulate. At the same time, nutrients are flushed from the mineral soil but are retained in the thick surface organic (duff) layer. If the duff layer is disturbed, alder can invade the site and delay the regeneration of conifers.

Soil Groups

Soils within the Project Area can be grouped by typical properties that influence the use and management of an area. The methodology and accuracy of soil resource inventories is discussed in the TLMP Draft Revision (TLMP 1991a). Five soil types are important in the Project Area: (1) mineral soils, composed mainly of sand, silt, clay, gravel, and rocks; (2) soils formed over compact glacial till; (3) Tonowek and Tuxekan soils, made up of alluvial sand, silt, and gravel; and of special management concern; (4) organic soils, composed of partially decomposed plant tissues (muck); (5) the McGilvery soil series. This latter soil is composed of a thin layer of organic material overlaying bedrock. Figure 3-1 summarizes a variety of the characteristics of these soil groups. Table 3-3 displays the acres of these soil groups by VCU.

Table 3-3

Soil Types in the Polk Inlet Project Area Excluding Encumbered Lands (in acres)

	Glacial Till Soils	Tonowek and Tuxecan Soils	Other Mineral Soils	Total Mineral Soils	McGilvery Soils	Other Organic Soils	Total Organic Soils
610	1,832	645	4,778	7,255	0	3,610	3,610
611	740	7	2,076	2,823	360	2,547	2,907
612	2,975	0	397	3,372	132	1,854	1,986
613	4,991	242	3,479	8,712	1,034	8,243	9,277
618	874	266	8,194	9,334	373	7,064	7,437
619	1,682	35	3,538	5,255	152	3,036	3,188
620	5,820	357	8,533	14,710	817	7,552	8,369
621	5,454	16	11,091	16,561	240	6,405	6,645
622	81	278	9,109	9,468	0	7,810	7,810
624	1,860	57	8,712	10,629	302	3,295	3,597
674	1,005	357	8,836	10,198	721	6,935	7,656
675	711	96	2,747	3,554	59	3,197	3,256
Total	28,025	2,356	71,490	101,871	4,190	61,548	65,738

SOURCE: Forest Service, Ketchikan Area, database.

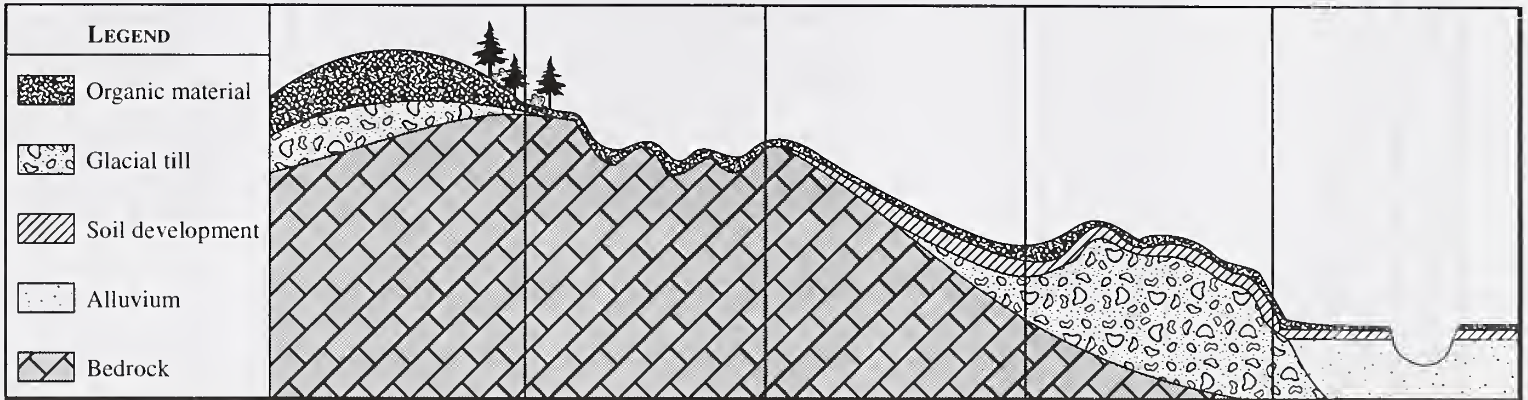
Mineral Soils

Mineral soils originate from deposits of glacial till, outwash, lake deposits, alluvium, and colluvium, and residual materials from bedrock. These soils have a potential for landslides when they occur on steep slopes. The mineral soil surface typically consists of partially decomposed organic material. Soil depths range from less than 20 inches to more than 20 feet. Drainage ranges from well to very poorly drained. These soils typically support a hemlock or hemlock-spruce vegetation series. Sites that drain poorly often support a mixed-conifer or western redcedar series. Mineral soils comprise 61 percent of the Project Area.

Glacial Till Soils

Glacial till soils are a type of mineral soil that formed in compact glacial till. These soils are typically found on lower valley sidewalls and low ridgetops. They are of management concern because of the potential for landslides. The dense, compact glacial till that underlies these soils

Figure 3-1
Soil Characteristics of Project Area



	Organic	McGilvery	Mineral	Till	Tonowek and Tuxekan
Description	Thick layer, partly to completely decomposed plant materials	Forest litter and partly decomposed plant material over bedrock	Shallow to deep soils developing in residuum or colluvium	Thin surface, soils developing in glacial till	Shallow to deep soils of stratified sand and gravel
Texture	Mucky peat	Peat	Sandy loam to silt loam	Sandy loam to silt loam	Sand and gravel
Soil Depth	7" to > 6'	< 8"	1' to > 6'	< 20" to < 6'	> 6'
Drainage	Poorly and very poorly drained	Well drained	Well to poorly drained	Well to poorly drained	Well to moderately well drained
Major Forest Types	Nonforest and varied forest types	Western hemlock	Western hemlock, mixed conifer	Western hemlock, Western hemlock/ yellowcedar	Sitka spruce
Landform	Ridgetops, benches, depressions, valley floor	Upper backslopes of hills and mountains	Valley floors, hillslopes, mountain sideslopes, ridge slopes	Moraines, drumlins, valley floor deposits	Floodplains, stream stream terraces
Mass Movement Index Class	Generally low	Low	Low to very high	Low to very high	Low
Timber Site Productivity Class	Low to moderate	Medium to high	Medium to high	Medium to high	High
Wetland Habitat Potential	High	Low	Medium	Medium	Very high
Upland Habitat Potential	Low	Medium	High	High	Very high

SOURCE: North Revilla Draft EIS, 1992.

is relatively impermeable. Water accumulates in the subsoil at the contact with this dense till, forming a layer that is relatively unstable and susceptible to sliding. Glacial till soils make up about 17 percent of the Project Area.

Tonowek and Tuxekan Soils

Tonowek and Tuxekan soils are found on stream bottoms, alluvial fans, and floodplains. In the floodplain zones near rivers, soils tend to be more poorly developed because of repetitive sediment deposition during floods. They typically support a riparian community of water-dependent plants including Sitka spruce, devils club, and red alder. Tonowek and Tuxekan soils previously harvested for timber are now in various stages of secondary plant succession. About 1 percent of the Project Area is made up of these soils.

Organic Soils

Organic soils are generally found on glacial deposits. Organic soils are common and widely distributed in the Project Area. Forested organic soils may range from well to very poorly drained. Nonforested organic soils are usually poorly or very poorly drained. They range from about 3 inches to over 40 feet in depth. Organic soils in Southeast Alaska typically support a mixed conifer, western hemlock-yellowcedar, western hemlock-redcedar, or shore pine vegetation series. If nonforested, they support a muskeg or alpine meadow community. Organic soils comprise 39 percent of the Project Area.

McGilvery Soils

McGilvery soils typically support western hemlock or western hemlock intermixed with cedar and spruce. Disturbance of the soil surface may result in exposure of the underlying bedrock. Restocking of forests on soil mapping units with greater than 41 percent McGilvery soils generally cannot be assured within 5 years of final harvest; therefore, such sites are classified as unsuitable for timber production. About 2.5 percent of the Project Area is made up of these soils.

Soil Properties

Long-term Soil Productivity

Soil and its productivity are critical elements to the forest because they also affect the productivity of most other forest resources. Tree growth and wildlife and fish habitat are often associated with soil productivity (the soil component of long-term site productivity), which is the inherent capacity of a soil to support the growth of specific plants or plant communities (FSM 2554.03). In the Project Area, timber site productivity of mineral soils ranges from very high on floodplains, till plains, and most other lowlands, to medium to high on moderately well to well-drained soils, to lowest on somewhat poorly to very poorly drained soils. Timber site productivity on poorly and very poorly drained organic soils, regardless of elevation or exposure is generally much lower than the productivity of mineral soils.

Because of the importance of organic matter on forest productivity, maintaining the organically enriched topsoil layers is critical for maintaining long-term site productivity. Soil productivity and its related nutrient content can be influenced in a number of ways by timber management activities. Removal of the surface layer may be caused by landslides, surface erosion, severe yarding disturbance, or from displacement by roads, skid trails, landings, or rock pits. Soils can also be damaged by puddling, which impairs soil porosity and drainage, and therefore reduces productivity. Changes in soil productivity that last beyond the planning period are considered to be significant impairments. Fifteen percent reduction in inherent soil productivity potential is used as a threshold for setting values for change in measurable or observable soil properties associated with long-term productivity (FSM 2554.03).

Soil Erosion

Two major types of erosion occur within the Project Area: (1) surface erosion, and (2) landslides.

Surface Erosion

In the forested areas of Southeast Alaska, the organic mat and mineral soil can absorb rainfall even at the highest precipitation rates. Consequently, overland flow by water and any resulting surface erosion of soil particles by processes such as sheetflow, rill, and gully erosion is uncommon. However, when mineral soils are exposed, erosion can occur. The rate of erosion depends primarily on the amount of vegetation ground cover, erodibility of the soil, and slope steepness. Surface erosion and mass wasting most likely occur along stream banks, snowslide or avalanche slopes, and within V-notches. Timber harvest activities and road construction may increase the erosion rate by exposing mineral soil.

Landslides

Landslides are the dominant process of natural erosion in Southeast Alaska. Many landslides occur during or immediately after periods of heavy rainfall when soils are saturated. Landslides usually occur on steep slopes that have soils with distinct subsurface "slip" layers (slip-planes), such as compact glacial till or bedrock that slopes parallel to the ground surface. These areas have a high likelihood of naturally occurring landslides or landslides caused by blasting rock or road pioneering, side casting of excavated material, or logging practices that cause substantial surface disturbance.

Soil mass movement indices (MMI's) have been developed by the Forest Service Ketchikan Area as a general and site-specific planning tool. The procedure ranks site characteristics, soil types, and slope angle into low, moderate, high, and very high mass movement categories (Forest Service 1989b). Soils with a very high MMI are not harvested and are excluded from the tentatively suitable Commercial Forest Land (CFL) base. When applied at the planning level, the acres of land with specific MMI's are determined based on the soil mapping units in the soil survey. Soil mapping units are complexes of two or more soil types. A complex is an area of two or more different soils that occur in a regularly repeating pattern that can be mapped on aerial photographs. The percentage of each soil in each complex in the Project Area was developed during the soil and vegetation survey and each soil's MMI was rated separately. This information was used to calculate the acres of each MMI in the Project Area (Table 3-4) prior to field verification. During the 1992 summer season, 193 harvest units were examined in the field. The mass movement hazard of these units was evaluated using criteria such as percent slope, local site drainage, and actual mass movement occurrence. Sites that had a very high potential for mass movement were identified and excluded from the unit during boundary layout. No area mapped as very high MMI was modified to high MMI. Table 3-4 also shows the acres added to the very high MMI during field verification. Acreage additions to the very high MMI and McGilvery soils by harvest unit number based on this field verification are shown in the Polk Inlet Soils Resource Report (Stewart 1993).

Table 3-4

Soils by Mass Movement Index (MMI) Class and Area Harvested (through 1994) in the Polk Inlet Project Area, Excluding Encumbered Lands (in acres)

MASS MOVEMENT INDEX (MMI)

Mass Movement Index (MMI) ratings tell how susceptible soil groups are to landslides under natural conditions.

MMI 1 - low potential for landslides
MMI 2 - medium potential
MMI 3 - high potential
MMI 4 - very high potential for landslides

	Low and Moderate MMI Class		High MMI Class		Very High MMI Class	
VCU	Total Area	Harvested Area	Total Area	Harvested Area	Total Area[1/]	Harvested Area
610	8,474	1,953	2,391	878	0	0
611	3,808	157	1,922	176	0	0
612	3,583	6	1,775	9	0	0
613	14,081	472	3,870	403	38 (38)	0
618	9,905	526	6,494	401	372 (176)	10
619	5,340	398	3,051	742	52 (52)	0
620	16,229	2,470	6,357	969	493 (121)	71
621	17,665	3,471	5,491	1,931	50 (50)	0
622	16,377	2,427	886	183	15 (15)	0
624	13,100	2,708	1,118	830	8 (8)	0
674	9,304	91	8,411	22	139 (74)	0
675	4,413	0	2,283	0	114 (65)	0
Total	122,279	14,679	44,049	6,544	1,281 (599)	81

SOURCE: Stewart 1993.

1/ Area added to Very High MMI class based on field verification shown in parentheses.

Wetlands, Floodplains, and Riparian Areas

Key Terms

Aquatic ecosystems—the stream channel, lake or estuary bed, water, biotic communities, and the habitat features that occur therein.
Channel type—the defining of stream sections based on relief, landform, and geology.
Estuarine—deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, but which have open, partly obstructed or sporadic access to the open ocean, and in which ocean water is diluted by freshwater runoff.
Forested wetlands—wetlands that have forest cover.
Hydrophytic vegetation—plants typically found in wetlands and dependent upon wetland moisture regimes for growth and reproduction.
Muskeg (peatlands)—a type of bog that has developed in depressions, or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses and heaths.
Primary succession—vegetation development that is initiated on surface exposed for the first time, which has never supported vegetation before.
Riparian areas—geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.
Riparian ecosystems—a transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.
Riparian management area—the area including water, land and plants adjacent to perennial streams, lakes and other bodies of water that is managed for the inherent qualities of the riparian ecosystem.
Secondary succession—the process of re-establishing vegetation after normal succession is disrupted by fire, cultivation, timber harvest, windthrow, or any similar disturbance.
Wetlands—areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wetlands

Introduction

Section 404(f)(1)(A) and (E) of the Federal Clean Water Act exempts silvicultural, timber harvesting, and related road construction activities from permit requirements for the discharge of dredge and fill material in wetlands. Executive Order 11990, as amended (42 U.S.C. 4321 et seq.), however, requires Federal agencies having statutory authority and leadership over Federal lands to avoid, to the extent possible, the short- and long-term adverse impacts associated with the destruction or modification of wetlands. Where feasible, direct or indirect support of new construction in wetlands must be avoided. Federal agencies are required to preserve or enhance the natural and beneficial values of wetlands in carrying out their responsibility to: (1) acquire, manage, and dispose of lands and facilities; (2) provide Federally undertaken, financed, or assisted construction and improvements; and (3) conduct Federal activities and programs affecting land use.

The U.S. Army Corps of Engineers Wetlands Delineation Manual (COE 1987) provides the standard for determining a site's wetland status. In addition, DeMeo and Loggy (1989) have developed wetland identification procedures specific to Southeast Alaska's vegetation communities. Under COE (1987), sites are considered wetlands when they meet criteria regarding soil, hydrology, and vegetation. Generally, wetlands are those sites that remain water-saturated for sufficient lengths of time that hydrophytic vegetation dominates and certain soil characteristics develop. The DeMeo and Loggy (1989) procedure evaluates the vegetation and soil layers of the GIS database and then assumes the presence of the wetland hydrological criteria. In addition, their procedure calculates wetland acreages based on the general percentage of the vegetation and soil types within mapping units in a manner similar to that discussed for the MMI in the *Soils* section of this chapter. Consequently, their procedure generates a maximum acreage of potential wetlands rather than a wetland delineation and associated acreage.

Wetland Types

Types of wetlands include estuaries, lakes and ponds, and other plant communities formed on both mineral and organic soils (Cowardin et al. 1979). Table 3-5 lists the acreages of the different types of wetlands in the Project Area. Streams and rivers are also considered wetlands. These are discussed in the *Water, Soil, and Fisheries* section. The major wetlands in Southeast Alaska are made up of forested sites on both poorly drained organic and mineral soils and of nonforested, herbaceous plant-dominated sites on organic soils (muskegs or peatlands). Forested wetlands and muskegs comprise approximately 45,088 and 24,420 acres, respectively of the Project Area. Major estuaries are located at the mouths of the Harris River, Indian Creek, Sunny Creek, Big Creek, and Old Tom Creek; at the heads of Twelvemile Arm, Polk Inlet, McKenzie Inlet, and Cholmondeley Sound; and in Goose Bay. Estuaries comprise about 578 acres of the Project Area. Lakes and ponds can have deepwater or nearshore habitat. Lakes and ponds are widely distributed and comprise about 1,326 acres of the Project Area. Major lakes include the Old Franks system, and Dog Salmon and Rock Lake southwest of Polk Inlet.

Table 3-5

Wetlands in the Polk Inlet Project Area (in acres)[1/ 2/]

Wetland type	Acres
Forested[3/]	45,088 (7,103)
Muskegs (Peatlands)	24,420
Estuary	578
Lakes and Ponds	1,326
Total Wetlands	71,412
Total Project Area	188,801

SOURCE: Stewart 1993.

1/ Many of the wetlands in the Project Area occur in complexes with nonwetlands or other wetland types. A complex is an area of two or more dissimilar vegetation and soil types occurring in a regularly repeating pattern that can be mapped on aerial photographs. Values for this table were derived using percent composition of each vegetation and soil type of the complexes. These percentages were determined during the soil and vegetation survey

2/ Lengths of streams are shown in Table 3-8.

3/ Acres previously harvested shown in parentheses.

Wetland Values and Functions

Wetlands are associated with significant values and functions (Reppert et al. 1979). Values are socioeconomic and include wildlife viewing and harvest, commercial fishing, development, community water supplies, actual and potential recreation, and timber harvest. Functions are ecosystem attributes and can be organized as follows:

- Physical functions: flood conveyance, coastal erosion barriers, groundwater recharge and discharge, heat absorption, and sediment collection.
- Chemical functions: acidic water pH levels, high tannins, and the ability to accumulate significant carbon and nitrogen.
- Biological functions: timber production (generally in lower volume classes), and provision of critical habitat for fish (notably salmon) and wildlife (notably waterfowl and bears).

Muskeg

Floodplains

Executive Order 11988 directs Federal agencies to lead and take action to the extent possible in preventing the long- and short-term adverse effects caused by occupying and modifying floodplains. Agencies are required to: (1) avoid the direct or indirect support of floodplain development whenever there are practicable alternatives; (2) evaluate the potential effects of any proposed action on floodplains; (3) ensure that planning programs and budget requests

consider flood hazards and floodplain management; and (4) prescribe procedures to implement the policies and requirements of the Order.

Floodplains are usually composed of sediments carried by the stream or river and deposited in slack water areas adjacent to the channels during periods of high water. Floodplains are defined as areas subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year. Floodplains are generally associated with larger streams such as the Harris, Indian, and Polk rivers. Consequently, floodplains are usually associated with Class I streams, although larger Class II streams can form floodplains. Class 3 streams rarely have floodplains. Nutrient-rich sediments underlain by coarse, well-drained sediments make floodplains the most productive lowland timber sites on the Project Area. No flood hazard studies have been conducted for the Project Area. Project Area floodplains identified based on soil maps and acreages by VCU are presented in Table 3-6.

Table 3-6
Floodplain Acreages in the Polk Inlet Project Area

VCU	Acres
610	645
611	7
612	0
613	242
618	266
619	35
620	357
621	16
622	278
624	57
674	357
675	96
Total	2,356

SOURCE: Stewart 1993.

Riparian Areas

Riparian areas comprise an aquatic and riparian ecosystem, the adjacent floodplain, and wetlands, and have distinctive resource values and characteristics. Riparian vegetation is important in maintaining streambank and floodplain integrity. Riparian vegetation slows water velocity on the floodplain and its roots inhibit erosion along stream and river banks. Riparian vegetation also helps provide shade, leaf and needle litter which fuels aquatic food chains, and sources of large woody debris (LWD), which is an important component of instream fish habitat. Harvesting to streambank removes riparian vegetation and can affect sediment delivery, fish habitat, and stream productivity. Standards and guidelines and management prescriptions proposed in the TLMP Draft Revision (1991a) include several levels of riparian and stream protection, including minimum Tongass Timber Reform Act (TTRA) buffers,

extended width buffers, variable width buffers, and other Best Management Practices (BMP's) prescribed in the field based on site-specific analysis. The TTRA requires riparian buffers "no less than one hundred feet in width on each side of all Class I streams and on those Class II streams which flow directly into Class I streams." The field examination of all harvest units in the Project Area ensures that Class I and II streams have been identified.

Field-designated management prescriptions for Class III streams include split yarding or controlled felling of trees, which would minimize potential for streambank disturbance. In addition, logging only to the slope break can be prescribed when Class III streams are observed to have unstable deposits along their banks.

The effects of management activities on riparian areas are considered in the *Water, Fish, and Fisheries; Wildlife*; and *Biodiversity* sections.

Riparian Management Area Definition

The National Forest Management Act (NFMA) 219.27 (12)(e) requires the establishment of riparian management areas to conserve soil and water resources and to preclude permanent impairment of the productivity of the land. Riparian management areas are not zones of exclusion; rather, they are areas where topography, vegetation, soil, climatic conditions, management objectives, and other factors are to be considered in determining management practices and constraints.

Riparian management area boundaries include: (1) a *minimum* distance of 100 feet slope distance perpendicular to all perennial streams, bodies of water with actively flowing fresh water (including lakes with an active inlet and/or outlet), bodies of fresh water which fish inhabit, and estuaries; (2) a *minimum* 150-foot-slope distance for channel types B3, C1, C3, C4, C6, D4, D5, and L2 (Forest Service 1992a); (3) the inventoried riparian area as previously mapped and recorded and associated with freshwater bodies and estuaries listed under items 1 and 2; and, (4) those lands with very high mass movement potential and floodplain soils immediately adjacent to streams and riparian management areas identified in items 1 to 3 to provide water quality protection. Riparian management area acreages in the Project Area are shown in Table 3-7. Acres of previously harvested riparian management area are also shown in Table 3-7.

Stream and Lake Buffer Prescriptions

Stream buffer prescriptions used to plan timber harvest units are based on a combination of stream class and channel type (Appendix C), and in all cases equal or exceed minimum buffer widths specified in the TTRA. Channel types are fully described in the *Channel Types Field* Guide (Forest Service 1987a), and *Channel Types User* Guide (Forest Service 1992a). In addition, lakes larger than 50 acres receive 100-foot no-harvest buffers plus an additional 400-foot selective-harvest buffer (Appendix C). Lakes less than 50 acres but greater than 5 acres receive 100-foot no-cut buffers. Lakes less than 5 acres generally are not buffered.

The buffers in Appendix C are an initial planning tool. The widths of Class I and II stream buffers may be extended in the field based upon further on-site analysis. Similarly, Class III streams not requiring buffers may receive buffers of variable width, based on site-specific conditions.

Table 3-7

Riparian Management Area and Previously Harvested Riparian Management Area in the Polk Inlet Project Area (in acres)

				Additions to RMA by		
VCU	Class I Streams	Class II Streams	Class III Streams	Riparian Soils	Very High Hazard Soils	Total
Riparian Management Area by VCU (in acres)						
610	641	158	498	343	0	1,640
611	269	44	309	1	0	623
612	400	75	226	0	0	701
613	2,043	251	967	85	0	3,346
618	1,234	185	879	109	46	2,453
619	356	94	363	10	0	823
620	1,435	255	1,314	139	480	3,623
621	491	387	1,302	9	0	2,189
622	953	357	844	101	0	2,255
624	667	383	707	33	0	1,790
674	578	161	1,039	164	30	1,972
675	562	106	316	31	29	1,044
Totals	9,629	2,456	8,764	1,025	585	22,459
Previously Harvested Riparian Management Area by VCU (in acres)						
610	344	47	134	251	0	776
611	8	0	22	0	0	30
612	93	0	0	0	0	93
613	191	14	68	0	0	273
618	75	30	60	25	0	190
619	2	5	46	0	0	53
620	184	47	183	25	61	500
621	330	124	235	5	0	694
622	380	42	104	64	0	590
624	170	84	241	15	0	510
674	7	10	4	0	0	21
675	0	0	0	0	0	0
Total	1,784	403	1,097	385	61	3,730

SOURCE: Forest Service, Ketchikan Area, database.

Water, Fish, and Fisheries

Key Terms

Adfluvial—fish that ascend from freshwater lakes to breed in streams.
Alevin—newly hatched salmon that are still attached to the yolk sac.
Alluvial fan channel—a fan-shaped deposit of sand, gravel, and fine material made by a stream where it runs out onto a level plain or meets a slower stream.
Anadromous—fish that ascend from the sea to breed in freshwater streams.
Aquatic Habitat Management Unit (AHMU)—areas for managing the resources associated with streams and lakes.
Bedload—sand, silt and gravel, or soil and rock debris rolled along the bottom of a stream by moving water.
Best Management Practices (BMP's)—land management methods, measures or practices intended to minimize or reduce water pollution.
Biotic—living.
Channel types—the defining of stream sections based on watershed runoff, landform relief, and geology.
Estuary—relatively flat, intertidal, and upland areas where saltwater meets fresh water, as at the heads of bays and the mouths of streams.
Large Woody Debris (LWD)—any large piece of relatively stable woody material having a diameter of at least 10 centimeters and a length greater than one meter that intrudes into a stream channel; also called Large Organic Debris (LOD).
Management Indicator Species (MIS)—species whose population changes are believed to best indicate the effects of land management activities; fish MIS for Polk Inlet EIS are coho and pink salmon and Dolly Varden char.
Mitigation—measures designed to counteract environmental impacts or to make impacts less severe.
NTU—nephelometric turbidity units, a unit of measurement based on the amount of light transmitted through water.
Resident fish—non-migratory fish that complete their entire life cycle in fresh water.
Salmonid—refers to the group of fish to which salmon belong.
Sediment—water-transported earth materials (e.g., gravel, sand, silt).
Smolt—a juvenile salmon, trout, or Dolly Varden migrating to the ocean and undergoing physiological changes to adapt its body from a freshwater to a saltwater environment.
Solute—substance dissolved in a solution.
Stream flow regime—the characteristic discharge of water from a watershed that occurs in the natural stream channel.
Stream order—the designation (first, second, third, etc., stream order) is of the relative position of stream segments in a drainage basin network with the smallest, unbranched, intermittent tributaries terminating in an outer point designated as first order streams; the junction of two first order stream segments produces a second order stream segment; the junction of two second order stream segments produces a third order stream segment, etc.
Third order watershed— a watershed that contains a third order stream segment.
Turbidity—an indicator of the amount of sediment suspended in water.
V-notch—a deeply incised, narrow valley along a drainage with a characteristic "V" shaped cross-section.
Watershed—area that contributes runoff water to a waterway.

3 Affected Environment

Introduction

This section describes the water resources, fish biology, and fisheries resources of the Polk Inlet Project Area. Water and fisheries resources are abundant in the Project Area and they are intimately related.

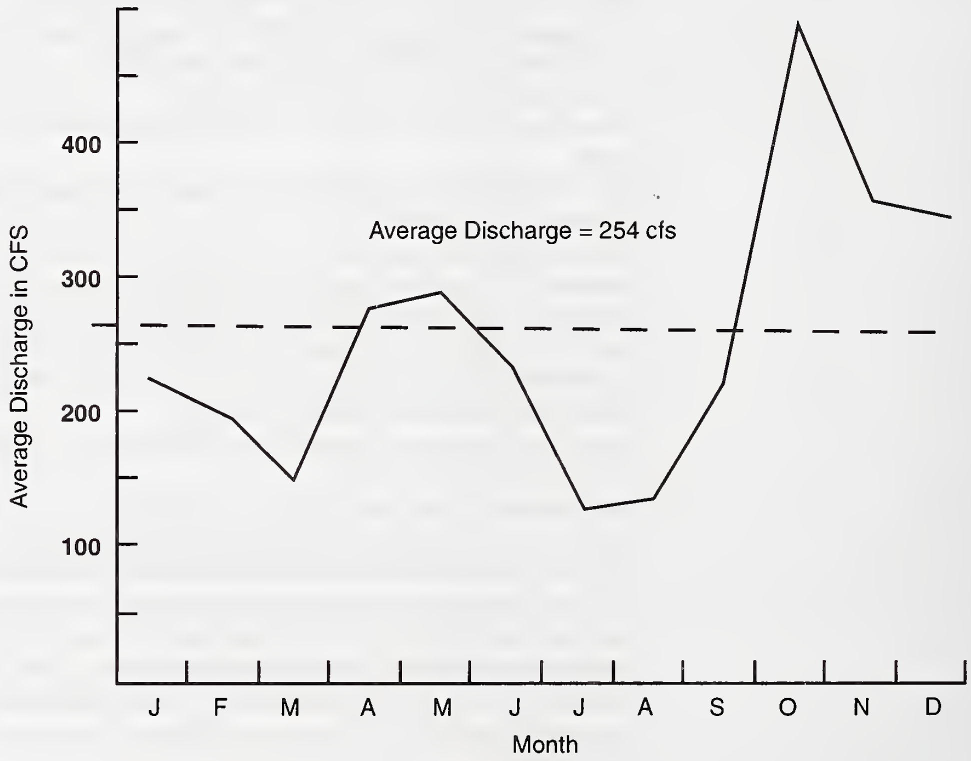
Water Resources

The Polk Inlet Project Area contains a variety of freshwater resources. These resources are described below under the categories of hydrology, water quality, and consumptive water uses.

Hydrology

The yearly runoff cycle follows the seasonal variations in temperature, rainfall, and snowmelt. The Harris River is representative of rivers in the Project Area (Figure 3-2). It has two low-flow and two high-flow periods (Schmiege et al. 1974). In March, average monthly discharge drops to about 150 cubic feet per second (cfs) because of cold temperatures and minimal snowmelt. In late May to early June, average discharge increases to about 290 cfs as spring precipitation changes to rain and snowmelt occurs. During the summer, precipitation decreases and evapotranspiration increases; consequently, river discharge drops to an average monthly value of about 125 cfs in late July. Average river discharge rises in parallel with the increase in fall rainfall and reaches a peak of almost 500 cfs in November. After November, the return of cold temperatures and snowfall causes a decrease in runoff to the March low flow.

Figure 3-2
Average Monthly Discharge for Harris River, 1950 to 1964



SOURCE: Schmiege et al. 1974.

Because of the steep slopes in the Project Area and the soil's high water transmissivity, both small stream and river runoff generally respond quickly to rainfall events. For example, James (1956) reports that within 16 hours Maybeso Creek responded to a 1.25-inch rainstorm with a rise in stage from 0.8 to 2.6 feet. He also demonstrates that Maybeso Creek, Harris River, and Indian Creek react to precipitation almost identically. Base flow for these drainages is slightly different. Base flow for Maybeso Creek decreases from about 35 cfs after 10 days without rain to 13 cfs after 30 days. The values for equivalent periods are 64 and 26 cfs, and 5 and 3 cfs for the Harris River and Indian Creek, respectively.

Water Quality

Water quality is influenced by sediment, water chemistry, and water temperature. Water quality affects use by humans, fish, and all other organisms.

Stream Sediment

Sediment is water-transported materials such as gravel, sand, and silt. Gravel and sand move along the stream bottom as bedload. Silt is generally transported within the water column as suspended load and causes water to appear murky or turbid. Stream sediment originates from natural geological processes and from human activities. The primary sediment inputs to streams are from landslides, streambank erosion, and roads. Stream sediment can reduce stream habitat quality, restrict sunlight penetration, and clog pores between gravels preventing the flow of oxygen-rich water to fish eggs. The Alaska Water Quality Standards for growth and propagation of fish, shellfish, and other aquatic life, and wildlife require that turbidity shall not exceed 25 NTU above natural levels. The standards also state that the percent accumulation of fine sediment (0.1 to 4.0 mm) in the gravels of anadromous or resident fish spawning waters may not be increased more than 5 percent by weight over natural conditions. In no case may that sediment range exceed a maximum of 30 percent by weight.

Data in NTU's do not exist for the Project Area, but Meehan et al. (1969) report ranges of suspended sediment in parts per million: Maybeso Creek, 0.0 to 148.7; Harris River, 0.0 to 46.6; and Indian Creek, 0.0 to 57.6. NTU values are directly related to parts per million of sediment; to be converted, however, the relationship has to be established on a watershed by watershed basis (Beschta 1980, Lloyd et al. 1987). Meehan et al. (1969) also report no statistically significant changes in suspended sediment mean or regression values from their study of before and after logging on Maybeso Creek.

Grain size distribution of bed sediments in the Project Area have been reported by McNeil and Ahnell (1964), Sheridan and McNeil (1968), and Sheridan et al. (1984). For the Harris River and Twelvemile Creek, Sheridan et al. (1984) report mean values of less than 0.83 mm sediment between 4.8 and 5.4 percent. For the Harris River, Sheridan and McNeil (1968) report mean values of less than 0.83 mm sediment between 13.9 and 14.2 percent for 1959 pre-logging samples. McNeil and Ahnell (1964) report 1959 pre-logging grain size distributions for the size range between 0.1 to 4.0 mm as 54 and 43 percent by volume for the Harris River and Twelvemile Creek, respectively.

Fubar Creek, which drains to the Harris River, is on the State of Alaska impaired water body list prepared under the Clean Water Act Section 305(b) and 303(d) (impaired). Previous landslides associated with timber harvesting in the 1960's contributed sediment to the stream. New landslide activity has occurred within the Fubar Creek drainage associated with the October 1993 storm system after field verification was performed, though no detailed data exist on stream channel effects.

Water Chemistry

Water chemistry influences all aquatic life by providing nutrients and trace elements. The addition of man-made chemicals such as fertilizers used in erosion control along roads or

petroleum products from vehicles or storage areas can affect water quality. Within the entire Forest Service Ketchikan Area, numerous samples show that streams remain within the water quality standards (Forest Service 1989a). Specifically, within the Polk Inlet Project Area, laboratory measurements of pH, dissolved solids, conductivity, and chemical constituents show that the streams in this area also fall within Alaska State Water Quality Standards. A selection of these laboratory data are included in Baker and Stewart (1993).

Stream Temperature

Stream temperatures are important in regulating biologic productivity in the aquatic environment. Alaska Water Quality Standards establish an upper range of temperature limits of between 55.4 and 59°F for growth and propagation of fish, shellfish, and other aquatic life and wildlife. Temperature shall not exceed 68°F at any time. Stream temperatures recorded in the summer of 1992 by field personnel within or near potential harvest units were from 42.8 to 57.2°F. The sampling periods included a range of weather and cloud conditions during an atypically dry and warm summer. Additionally, a variety of water temperature samples taken by Forest Service personnel over a range of conditions in the Project Area between 1981 and 1984 did not record temperatures above these values (Baker and Stewart 1993). This is in contrast to the historical measurements in Maybeso Creek shortly after the removal of 25 percent of the watershed forest and clearcutting to stream bank in the 1950's. During that period, temperatures were frequently greater than 60°F resulting in average and peak summer temperatures significantly higher as a result of the harvest methods used at that time (Meehan et al. 1969).

Consumptive Uses

Key consumptive water uses within the Project Area include domestic and recreational water supply. Domestic water use occurs at several locations within the Project Area on private land. The community of Hollis, with a population of about 100 in four subdivisions, obtains a portion of its water from nearby small streams with no water treatment (personal communication, John Laird, Hollis Community Council, July 23, 1992) and the remainder from rainwater catchment. Domestic water use also occurs at Sunny Cove and Cannery Creek where there are approximately 9 and 3 cabins, respectively. Currently, one cabin at each site is occupied year-round; the rest receive seasonal and recreational use. These localities use surface water and rainwater catchment for their water supply. There are no congressionally designated municipal watersheds within the Project Area. Domestic water use also occurs on Federal land at the floating logging camp and the Forest Service compound and floating barge at Polk Inlet. These sites use local surface water supplies and rainwater catchment. Water use from streams and lakes occurs at the numerous recreational sites in the Project Area. These sites are discussed in the *Recreation* section of this chapter.

The Alaska Water Quality Standards (19 AAC 70) generally applicable for the Project Area are those for the propagation of fish, shellfish, and other aquatic life, and for wildlife. The appropriate parameters were summarized above in the *Water Quality* section. The Alaska Water Quality Standards for water supply are more stringent than those for fish and wildlife. Values for turbidity shall not exceed 5 NTU above natural conditions when the natural turbidity is 50 NTU or less; there should not be more than a 10 percent increase in turbidity when the natural condition is more than 50 NTU; and values are not to exceed a maximum increase of 25 NTU. Water temperatures shall not exceed 59°F.

Fish and Fisheries Resources

Fish and aquatic resources in the Polk Inlet Project Area help support subsistence use and commercial and sport fisheries. These resources are important to the economy and lifestyles of area residents and visitors (see *Subsistence* and *Recreation* sections of this chapter).

The Project Area streams contain important anadromous and resident fish habitats. The streams support four species of anadromous salmon (pink, chum, coho, and sockeye, includ-

ing resident kokanee), as well as cutthroat trout, rainbow/steelhead trout, and Dolly Varden char. King salmon are found in the inlets and bays of the Project Area, but do not spawn in its streams. These fish species are the ones of most importance to the commercial, recreational, charter boat/lodge, and subsistence fishery of the region. Additionally, these fish supply a major food resource to black bears, river otters, eagles, and other wildlife. Other nongame species are also present in the project streams and waters including sculpin, sticklebacks, and smelt (Taylor 1979).

Enhancement projects have been implemented in several regions within the Project Area to improve these important fisheries resources. These include the installation of adult fish passage facilities around natural barriers on Cable, Sunny, Old Franks, and Dog Salmon creeks. Habitat enhancement, including the addition of large woody debris and gabion structures, has occurred in the Cable Creek drainage (tributaries include Beaver, Snipe, Dead Battery, and Sparrow creeks), and Camp and Twelvemile creeks. Future basinwide habitat enhancements that include addition of instream structures, control of basin erosion runoff into streams, riparian vegetation planting, and culvert maintenance where necessary, are planned for the Harris River and the Cable, Camp, Twelvemile, Cave, Trocadero, and Maybeso creeks.

Fish passage structure installation and habitat improvements have had varied success. The installations of fish passage facilities at Dog Salmon Creek and Sunny Creek work well for passing pink and chum salmon. The Dog Salmon structure may have also improved passage of coho and sockeye, which previously ascended above the barrier to various degrees of success. The Cable Creek structure has not improved escapement as a chute about 350 feet above the passage structure remains a barrier to passage. The two Old Franks passage structures installed in 1992 appear to be providing successful passage to coho salmon, while pink salmon have only been observed above the first passage structure and they may not be able to pass a cascade between the structures (personal communication, John Hannon, Fish Biologist, U.S. Forest Service, Craig, Alaska, May 20, 1993). About half of the structures that were installed in the mid and late 1980's in the streams are still functioning as designed, increasing pool habitat in the various streams.

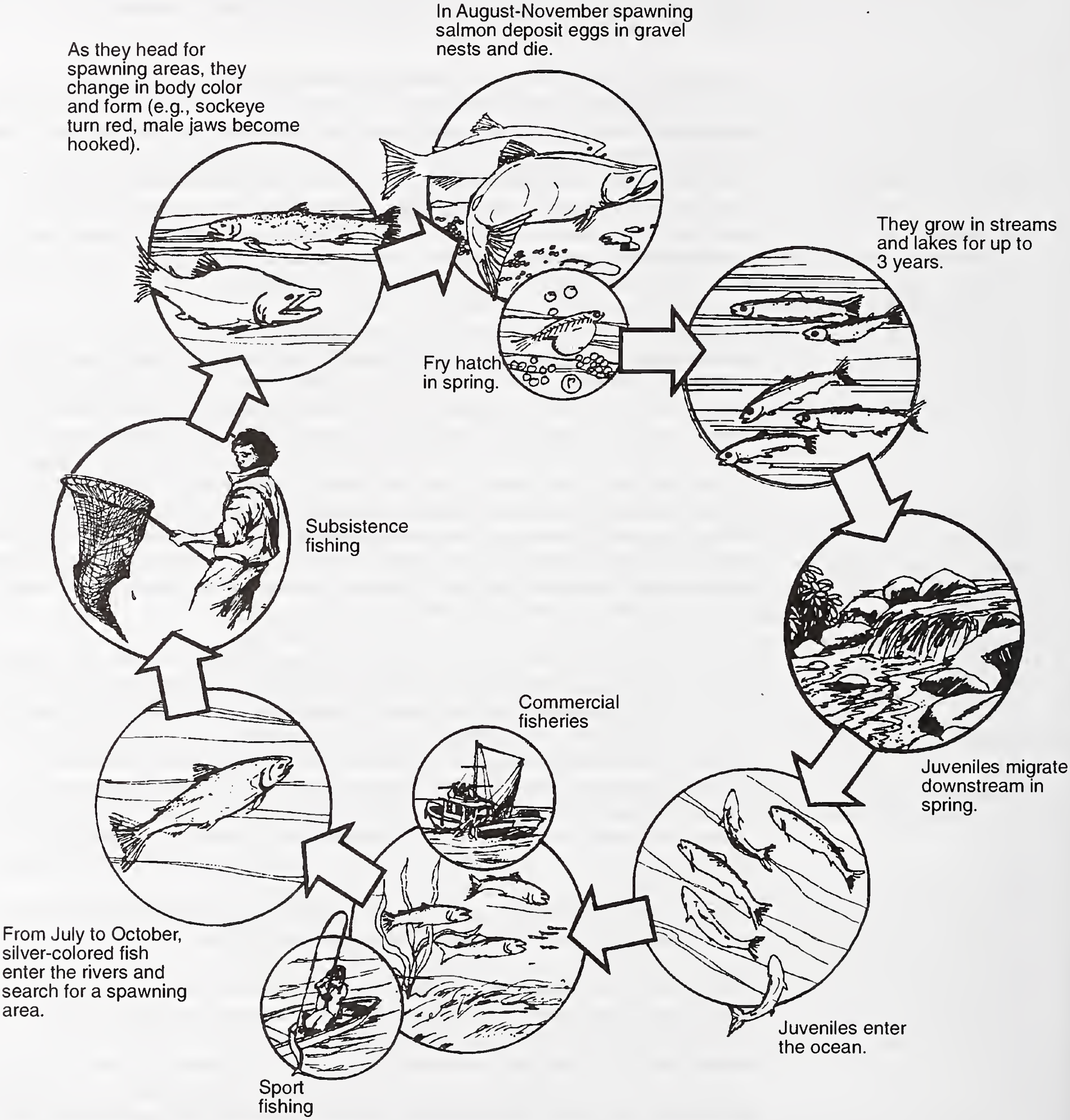
Anadromous fish spend at least part of their life in freshwater and part in saltwater (Figure 3-3). Salmon lay their eggs in stream gravels, and the juvenile fish hatched from the eggs, emerge from the gravels. Depending on the species of salmon, the amount of time the juveniles spend in freshwater is variable. Pink salmon start their downstream migration immediately after emergence, while coho salmon juveniles generally spend two years in freshwater before migrating to the ocean. Pink and chum salmon are especially dependent on estuaries during their early life stages. Salmon reach maturity in the ocean, only to return to their natal streams to spawn and die and start the cycle again. Steelhead trout follow a cycle similar to coho salmon, except they often survive the spawning season, return to the ocean, and spawn again.

Resident trout, char, and kokanee spend all of their lives in freshwater, spawning in stream gravels and growing to maturity in the streams and lakes of the area.

Estuaries, which are also present in the Project Area, are important aquatic resource regions. Estuaries are unique systems because they form transitions between terrestrial, freshwater, and marine environments. Estuaries are rich and diverse, harboring many resident species and providing food, spawning areas, or shelter for numerous other species including anadromous salmon and trout at critical points in their life cycle (Forest Service 1985a). In the Polk Inlet Project Area, crab, shrimp, clams, mussels, and various marine fishes are associated with the estuaries and surrounding waters which form a nursery for their young. Herring and smelt also use these areas for spawning and feeding.

Major estuaries can be found in the Project Area primarily at the heads of bays and inlets where major streams enter. Smaller estuaries are present at most stream mouth regions (see *Floodplains, Wetlands, and Riparian Areas* section in this chapter).

Figure 3-3
Salmon Life Cycle



STREAM CLASSES
Class I Streams — provide high quality habitat for anadromous and sport fish
Class II Streams— provide habitat for resident fish, but have limited sport fishing value
Class III Streams— have potential influence on water quality of downstream aquatic habitat

Stream Classification

Stream classes are a means to categorize stream channels based on their fish production values. There are three stream classes on the Tongass National Forest. Class I streams have anadromous (fish ascending from oceans to breed in freshwater) or adfluvial (fish ascending from freshwater lakes to breed in streams) lake and stream fish habitat. Also included is the habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations. Class II streams have resident fish populations and generally steep (often 6 to 15 percent) gradient, but can also include streams from 0 to 5 percent gradient where no anadromous fish occur. Fish populations in Class II streams have limited sport fisheries values. Class II streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use. Class III streams have no fish populations, but have potential water quality influence on the downstream aquatic habitat. Some steep gradient Class III streams run directly into saltwater and have no fish habitat influence. Table 3-8 shows the total mileage of Class I, II, and III streams in the Project Area GIS database by VCU (see discussion below for explanation of stream lengths).

Table 3-8

Miles of Stream by Stream Class in the GIS Database[1/]

VCU	Class I	Class II	Class III
610	12.0	6.4	20.0
611	2.4	1.7	12.8
612	14.6	4.3	7.8
613	33.5	9.9	38.6
618	15.7	7.1	33.3
619	10.9	4.6	15.3
620	22.8	10.1	51.9
621	13.3	16.1	52.8
622	37.3	17.4	44.6
624	29.1	15.6	35.7
674	18.7	9.5	53.8
675	8.7	3.9	12.3
Total	219.0	106.7	379.0

SOURCE: Forest Service, Ketchikan Area, database.

1/ GIS database underestimates total length of Class III streams.

Streams in the Polk Inlet Project Area were classified by the Forest Service based on available field data and map assessment. Where field data were not available, assigned stream classes were based primarily on the evaluation of maps and aerial photographs; channel types are based on definitions in Forest Service (1987a). The channel type definition as developed on the Tongass National Forest is an inventory and planning tool that stratifies stream and lake sections within a watershed into different stream process groups. The process groups are based on physical characteristics of streams and predict their physical response to different management activities. The most recent description of stream process groups and channel type is presented in the Channel Type User Guide, Tongass National Forest Southeast Alaska

(Forest Service 1992a). Based on channel type definitions and other available data, the Forest Service assigned an appropriate stream class and entered the data into the GIS stream data file. Stream class and channel type are used to help establish riparian buffer widths as prescribed in Appendix C.

The Project Team field verified stream classes and channel types during harvest unit investigations. During site visits, all stream classes and channel types were identified and noted on field unit cards for later transfer to the GIS. This field data was used to modify the GIS stream layer. This evaluation revealed that the actual number of small (mostly Class III) streams in units differed substantially from that present on the GIS stream data layer. The Class I and II stream lengths in each unit were found to be nearly the same as those presented in the original GIS database requiring almost no modification based on field verifications. But, Class III streams were very frequent; on average, 2.8 times more length of Class III streams were found in the areas surveyed than indicated on the original GIS layer. Table 3-8 presents stream miles based upon the GIS layer updated only in the vicinity of field-verified harvest units. Assuming the Class III multiplication factor is representative of the entire Project Area, then there are approximately 950 miles of Class III streams in the Project Area.

Fish Habitat Capability

Maintaining or improving habitat capability to produce salmon is a primary management goal of the Forest Service. The Forest Service is also concerned about maintaining escapement of sufficiently high numbers of adult salmon spawners to seed the available habitat. The Forest Service does not have jurisdiction over escapement. Adult spawner escapements depend on numerous factors, such as commercial harvest rates and ocean survival, that are not influenced by changes in upland management.

Fish production is potentially affected by upland timber management, and has previously been modeled for the Project Area (Forest Service 1989b). The number of fish that a particular habitat can potentially produce is termed habitat capability. Habitat capability for species harvested for subsistence, sport, and commercial purposes is of primary concern, since these species contribute to the livelihood and high economic returns to the region. The fishing industry provides both jobs and income for Southeast Alaska. Fishing, especially for salmon, is also a source of subsistence for residents of Prince of Wales Island. Additionally, salmon (particularly coho) are caught recreationally.

Several factors affect fish production or habitat capability within the stream environment. Many of the important factors can be affected by logging practices. A brief summary of the importance of some of the major environmental factors that can affect the production of fish within the systems is described below. General Forest Service guidelines to reduce effects resulting from harvest activity are also presented.

Sedimentation

Aquatic productivity can be influenced by the concentration of sediment in the water column and the amount of fine sediment introduced into spawning gravel. Direct effects include clogging and damage to gill filaments, and changes in fish behavior or habitat use (Marcus et al. 1990). Fine sediment introduced into stream gravels during incubation may cause physical entrapment and mortality of salmonid embryos in the redd. Sediment deposition decreases redd permeability, which limits the amount of intragravel flow and oxygen delivery to developing eggs and alevins (Marcus et al. 1990, Everest et al. 1985). Even if sediment deposition is not fatal to developing alevins, it may reduce their growth and fitness (Everest et al. 1985). Introduction of sediment can affect survival of fish eggs and newly emerged fry (alevins); therefore, road construction activities and use of equipment in Class I streams occurs only when eggs or alevins are not in the stream gravels. The allowed windows for

instream work generally occur prior to adult salmon entry into stream systems to avoid disturbance during spawning. The windows for instream operations can vary slightly from stream to stream and site to site. Site-specific fisheries and field information (including Alaska Department of Fish and Game [ADF&G] recommendations) are used to determine the operating windows and would be applied to the Project Area. In the Ketchikan Administrative Area, the windows for allowed instream operations are conservatively established to be June 1 to August 7 for pink and chum salmon, June 15 to September 1 for coho salmon, and July 18 through August 15 for steelhead trout. However, because of the variability of fish presence, abundance, and timing by system, the exact dates of allowable construction may vary from those presented for individual stream crossings.

Indirect effects of fine sediment also include embedding of gravels and filling of pools, both of which decrease the amount of available instream habitat for salmonids. Fine sediment fills cobble and gravel interstices, which serve as refugia for both juvenile and adult salmonids during the winter. The volume of pools also might be reduced. Pools are important habitat for salmonids and other fishes during the winter. Availability of suitable winter habitat probably limits production of juvenile salmonids in many Alaskan streams (Marcus et al. 1990, Heifetz et al. 1986).

The effects of fine sediment on aquatic systems are highly variable, and depend upon the amount added, the amount already present, and the system's ability to store and transport sediment. A general review of studies relating fine sediment and salmonid production (Everest et al. 1987) found that the assessments of potential effects ranged from "inconclusive" to "severe." In a similar review, Pella and Myren (1974) conclude that studies conducted on streams near Hollis in South Central Prince of Wales Island (Maybeso Creek, Indian Creek, Old Tom Creek, and the Harris River) failed to reveal a meaningful relationship between clearcut logging to streambank and subsequent pink and chum salmon escapements. The studies were inconclusive because of changes in salmon harvest rates, high natural variability in salmon escapements, and the short time-frame of the studies, among other factors. Interpretation of biological effects from potential increased sediment inputs must, therefore, be viewed with caution.

Fish productivity is limited by the nutrient content of the water, type of debris, low pool-riffle ratio, and embeddedness of cobble/bedrock. The maintenance of woody riparian vegetation is important as a source of nutrient input and as a source of debris to create pools and trap sediment in the stream.

Stream Temperature and Dissolved Oxygen

Summer high and winter low water temperatures and low dissolved oxygen influence fish survival and condition. Water temperature affects the metabolic rate of aquatic organisms and can affect the migration timing of adult and juvenile fish. When temperatures go up, dissolved oxygen levels decrease. Small changes in water temperature can affect incubation and development of eggs in stream gravels. Emergence, feeding, and growth of fry and juvenile fish are also affected. Temperature change has a large effect on eventual adult survival (Holtby and Scrivener 1989). Streamside forest or riparian vegetation plays an important role in regulating heat exchange on small forested streams by providing overstory cover that maintains water temperature (Beschta and Platts 1986). Harvest of riparian vegetation, as well as the total amount of harvest in a watershed, can affect water temperature. Dissolved oxygen levels in streams also affects survival of fish. Low concentrations particularly when fish abundance is high, and when higher temperatures occur can affect fish survival. Stream systems that are particularly sensitive to high temperatures include slow-flowing streams with southerly aspects and streams with shallow lake and muskeg sources such as portions of Old Franks system lakes.

Fish kills due to high temperatures or low dissolved oxygen have occurred in and near the Project Area. These fish kills have occurred during high air temperatures and low stream flows. In 1948, fish kills were recorded in Cabin Creek, Sunny Cove, and Cholmondeley Sound as well as several other areas in the Ketchikan Area (Forest Service 1994a). Recent fish kills include one on Cable Creek in August 1990 and in September 1993 on the Harris River, Old Tom Creek, and Trocadero Bay. The extent and severity of the 1993 fish kills across central and northern Prince of Wales Island was assessed by Forest Service and ADF&G fish biologists using aerial observations (Forest Service 1994a). The surveys were not quantitative, however. Area-wide, the majority of dead fish were pink salmon that were returning to Southeast Alaska in large numbers. A large number of dead chum salmon were also observed.

During fall 1993 stream flows were at a record low in all of Southeast Alaska. These low flows greatly reduced the total fish holding habitat and probably increased stream temperature conditions. When fish kills occurred, fish were present in very high densities. Water temperature was not thought to be lethal by itself. The highest temperature recorded was 16°C (60.8°F) on Staney Creek (Thorne Bay Ranger District; Forest Service 1994a). However, elevated water temperatures did contribute to the problem as warmer water holds less dissolved oxygen. These pre-spawning fish kills were observed in both logged and unlogged watersheds. The 1948 fish kills noted above were in unlogged areas. Similarly, the 1993 fish kills in Old Tom Creek were in an unlogged watershed. In contrast, Cable Creek and the Harris River watersheds have been extensively harvested.

Fish kills in other parts of Southeast Alaska have also been linked to crowding of spawning fish in high escapement years and resulting de-oxygenation of water from fish respiration. Such events are unpredictable and have not been directly attributed to the effects of timber harvest. Research has been initiated in the Ketchikan Area to determine the potential causes of these fish kills. The first phase of the research was conducted during the summer of 1990 on seven streams on Prince of Wales Island, under the direction of the Alaska Working Group on Cooperative Forestry/Fisheries Research (Pentec Environmental, Inc. 1991). The research was designed to address the physical instream reasons for adult fish kills (also known as prespawner mortality). No actual fish kills were observed during this phase of the research (Pentec Environmental, Inc. 1991).

Low winter temperatures can lead to detrimental winter stream conditions, such as anchor ice formation and freezing of spawning gravels, which can reduce pool size. Low temperatures may be aggravated by removing streamside vegetation. However, estimating the effects is difficult because of the influences of intermittent snow or ice cover, high variability in winter air temperature, and the wind and precipitation patterns commonly found in Southeast Alaska. For this reason, the implementation of TTRA and expanded width buffers may moderate temperatures year round (Marcus et al. 1990).

Large Woody Debris

Large Woody Debris (LWD) are trees and tree pieces greater than 4 inches in diameter and 6 feet long (Keller and Swanson 1979, Bilby and Ward 1989). LWD are one of the most important components of high quality fish habitat (Marcus et al. 1990). Also known as large organic debris (LOD), this material provides food and building materials for many aquatic life forms, provides cover for juvenile and adult fish, and is the primary channel-forming element in some channel types (Marcus et al. 1990).

LWD affects many aspects of streams, including channel morphology, sediment storage, water retention, stream nutrient cycling, macroinvertebrate productivity, and fish habitat (Marcus et al. 1990, Lisle 1986, Swanson et al. 1984). Pools formed by stable accumulations of LWD provide important habitat for rearing salmonids, particularly in winter (Heifetz et al. 1986, Murphy et al. 1986). High LWD loadings are associated with variations in bankfull width and increased amounts of stream edge; edge habitat is important for salmonid survival at high flows (Robison and Beschta 1990). Coho salmon and Dolly Varden char benefit directly from LWD. Both species prefer habitat cover provided by LWD (and pools formed by LWD), particularly during juvenile rearing. Pink salmon also benefit indirectly from LWD. Stable LWD accumulations in first and second order tributary streams store considerable amounts of sediment (Keller and Swanson 1979, Heede 1985, Swanson and Lienkaemper 1978), buffering sediment transport to downstream pink salmon spawning areas (pink salmon are limited by quality of spawning gravels and not rearing habitat [TLMP Draft Revision 1991a]).

LWD often changes the morphology of streams and results in a longitudinal stair-stepped pattern (Heede 1985). If the individual "steps" are too high, upstream fish passage may be blocked, particularly at lower flows. These blockages are rarely complete, however, and are relatively easy to breach or physically remove (Bryant 1983). Often, at higher flows, fish can jump over what appear to be complete barriers at lower flows.

Large accumulations of LWD in streams in the form of logging slash may be undesirable and in extreme cases may block fish passage. Logging slash may include larger branches and short sections of boles without rootwads. Much of this type of LWD is floatable and therefore, unstable (Bryant 1980). Unstable accumulations of LWD may wash out and destabilize streambanks, potentially causing reductions in fish habitat and overall stream productivity.

Timber harvest without stream buffers may reduce winter habitat for salmonids by removing sources of stable LWD, collapsing streambanks, and embedding of substrate (Marcus et al. 1990, Heifetz et al. 1986). Loss of LWD reduces both the amount and complexity of habitat for salmonids (Robison and Beschta 1990).

Prior to the enactment of expanded buffers, timber often was harvested to the edge of the streams and stream-cleaning operations were commonly conducted to prevent perceived fish passage problems. With the implementation of TTRA and expanded-width buffers, a source of LWD will be provided.

Blowdown of trees is a natural phenomenon in Southeast Alaska. There is evidence to show that blowdown does not occur randomly. Natural factors and shape of created openings determine the probability of blowdown occurring in adjacent stands (Harris 1989, Moore 1977). Under the TLMP Draft Revision standards and guidelines, blowdown potential is considered when designing harvest units. Some blowdown can contribute to the LWD needed to maintain instream habitat.

Fish Enhancement Projects

Table 3-9 shows the location of existing and planned Forest Service stream enhancement projects and the years they were implemented or scheduled for development . The single greatest increase in fish production potential is expected to come from the Old Franks Creek project. Based on estimates by Zadina and Haddix (1990), approximately 493,000 square feet of spawning area and approximately 1,023,700 square feet of rearing area above the second barrier falls will become regularly available to anadromous fish (including sockeye salmon) as

a result of this major enhancement effort. In addition to these planned stream enhancement projects, field verification of potential harvest units in 1992 resulted in identification of several new enhancement opportunities (see *Fish Enhancement Opportunities*).

MANAGEMENT INDICATOR SPECIES (MIS)
Coho Salmon
Pink Salmon
Dolly Varden Char

Management Indicator Species

Management Indicator Species (MIS) are used to characterize the existing conditions and evaluate the environmental consequences (in Chapter 4) of the alternatives on fish habitat capability. Specific models have been developed to estimate fish habitat capability for MIS. These models are indicators of past activities and projected changes in habitat due to management practices. Their purpose is to assist in characterizing the existing habitat potential and making determinations of comparisons between alternatives by management practice (see the *Wildlife* section in this chapter for further explanation).

Coho Salmon

Coho and pink salmon have been selected as MIS for anadromous fish species and represent two different phases of salmon life history: spawning/egg incubation and freshwater rearing. Dolly Varden char was selected to represent resident species for the Polk Inlet Project Area. Details on habitat capability models for pink salmon, coho salmon, and Dolly Varden char used for the following analysis are presented in (TLMP Draft Revision 1991a) and will be summarized under each species description below. It is important to note that habitat capability is measured in smolts for anadromous fish and in number of adult fish for resident species.

Coho Salmon

Pink Salmon

Coho salmon are highly dependent on quality rearing habitat for their health, growth, freshwater survival, and marine survival. The life pattern of anadromous cutthroat and steelhead trout is similar to coho. Coho juveniles spend an average of 2 years in freshwater streams and rivers, attaining a size of about 4 to 6 inches, before migrating to saltwater as out-migrating smolts. After an average of 2 years in the ocean, these fish return as mature adults and reach 6 to 20 pounds.

Dolly Varden Char

The period of freshwater habitation of juvenile fish limits this species' habitat capability. The production potential of streams is based on the quantity and quality of year-round rearing habitat. The number of out-migrating coho smolts produced by the stream system is directly related to the winter survival of the juveniles. The number of adult coho available to the subsistence, sport, and commercial fishery as well as the brood stock escapement is related to the number of out-migrating smolts.

Coho habitat capability is directly influenced by LWD recruitment. LWD is critical in providing both quantity and quality of rearing habitat for juvenile coho salmon. LWD serves both as a source of nutrients and as a structural component within and adjacent to the stream channel (Bryant 1983). The survival of the coho juveniles depends on the deep, quiet pools created by LWD, undercut banks, backwater sloughs and channels, and LWD's (Heifetz et al. 1986). Reduction in LWD recruitment, disturbance of off-channel habitat, and a decrease in winter stream temperatures have been directly influenced by past management activities, such as timber harvesting to stream banks. Because of the importance of LWD for coho production, its abundance in streams is a major parameter used in the coho habitat capability model (TLMP Draft Revision (1991a).

Coho Salmon

Table 3-9
Existing and Planned Stream Enhancement Projects in the Polk Inlet Project Area

Stream Name	VCU	ADF&G Stream No.	Project Type	Year Planned (P) or Implemented (I)
Old Franks Creek	613	103-60-44	Structural Fish Passages	1992(I)
Dog Salmon Creek	620	103-60-38	Structural Fish Passage	1992(I)
Cable Creek	624	103-60-77	Fish Habitat Structures II[1/]	1983-86(I)
			Structural Fish Passage	1986(I)
			Fishpass Maintenance	1993(P)
Sunny Creek	675	102-40-87	Structural Fish Passage	1984 (I)
			Fishpass Maintenance	1992(I)
Camp Creek	620	102-60-39	Fish Habitat Structures	1988(I)
			Fish Habitat and Basinwide Rehabilitation[2/]	1993(P)
Harris River	622	102-60-82	Fish Habitat and Basinwide Rehabilitation	1995(P)
Twelvemile Creek	621	102-60-72	Fish Habitat Structures	1991(I)
			Fish Habitat and Basinwide Rehabilitation	1997(P)
Trocadero Creek	624	103-60-75	Fish Habitat and Basinwide Rehabilitation	1998(P)
Cave Creek	621	102-60-73	Falls Modification/Barrier Removal	1999(P)
Indian Creek	622	102-60-80	Spawning Channel	1950's(I)[3/]
Maybeso Creek	610	102-60-840	Fish Habitat and Basinwide Rehabilitation	1995(P)

SOURCE Baker and Stewart 1993.

1/ Four tributaries of Cable Creek, Beaver Creek, Snipe Creek, Deadbattery Creek, and Sparrow Creek had log and gabion structures installed to increase pool habitat from 1983 to 1985.

2/ Basinwide rehabilitation includes: road and slope sediment control, culvert maintenance, riparian tree planting, and instream fish habitat structure placement.

3/ The pink and chum salmon spawning channel is currently not functional.

Smolt abundance values used in the coho habitat capability model were developed by estimating smolt habitat capability for the old-growth condition based on all population estimates that could be found and attributed to specific stream channel types in Southeast Alaska (TLMP Draft Revision 1991a). The estimated smolt abundance, by representative stream class and channel type, was then applied to all streams within each VCU for the conditions present in 1954 as representative of the period prior to major logging when LWD was abundant. Then the estimated change in LWD in streams, as a function of riparian zone harvest and rate of decay and addition of LWD, was determined. An adjustment factor for coho smolt abundance, dependent on quantity and importance of LWD estimated, was then applied to the corresponding streams to determine change in potential coho habitat capability. In this manner the habitat capability was estimated and relative effects of logging in each VCU was determined between 1954 and later years. Changes in coho salmon habitat capability from 1954 to 1995 shown in Table 3-10 are due to past harvest and enhancement activities (i.e., fishpass facilities installation).

By 1995, total Project Area coho habitat capability is predicted to increase by 38 percent. The installation of fish passage facilities is the factor causing the estimated increased potential coho production in the Project Area, particularly in the Old Franks drainage. Coho salmon habitat capability in the Old Franks system (VCU 613) after the passage facilities were installed is predicted to be the highest in the Project Area, equal to about 35 percent of all coho habitat capability. Other areas (VCU's 622, 674, 624, and 620) with large streams including the Harris River, Trocadero Creek, Cable Creek, Big Creek, and Dog Salmon Creek, account for a majority of the remaining coho potential in the Project Area (about 42 percent). Fish passage on the Dog Salmon Creek system also contributed significantly to the increased potential of this system. The decrease in coho potential estimated for many of the VCU's, and that would have been predicted for other VCU's had fish passage facilities not been installed, is the result of decay and loss of LWD in areas that had logging to the stream bank in Class I streams between 1954 and 1979.

Pink Salmon

Pink Salmon

Pinks (humpback) are the most widely distributed of the salmon. Pink salmon are important to the commercial fishery of Southeast Alaska, where they represent the greatest poundage harvested; an annual average of 85 million pounds were harvested between 1979 and 1988 (Forest Service 1992f). Their juveniles go to sea immediately upon emergence from the gravels of coastal streams. Pinks mature in the ocean for 2 years before returning to spawn. Spawning gravel quantity and quality is thought to be the primary factor that limits pink spawning habitat capability. Substrate composition, water quality and quantity, and water depth and velocity are important habitat components for salmon spawning and successful incubation of eggs to fry. Spawning generally occurs in riffles, with preferred sites occurring at the pool-riffle interface. A constant supply of clean well-oxygenated water is critical to the survival of eggs incubating in the gravels.

Management actions that could potentially affect pink habitat capability are those that would affect the spawning and incubation habitat by increasing stream sediment levels, destabilizing stream spawning habitat, and altering accessibility to migrating juveniles and adults. An increase in stream sediment levels can affect egg survival. Other activities that could potentially affect migration of juveniles and adults are those that affect fish passage, reduce migratory holding areas, increase stream temperature, and decrease available dissolved oxygen in migratory holding areas. Migratory holding areas are those deep quiet pools where adults school up to rest. These areas potentially can be reduced by changes in streambank stability, lateral scouring (widening and shallowing), and changes in sediment and bedload routing. Bank stability and lateral scouring are influenced by the amount of harvest near the stream. This affects the watersheds' ability to retain storm runoff and flood waters. Watershed stability and LWD influence changes in sediment and bedload routing.

Table 3-10

Coho Salmon Habitat Capability (Smolt Production) and Percent Change from 1954 to 1995 by VCU

VCU	1954	1991	%1/	1995	%
610	8,963	6,991	-22	6,696	-25
611	0	0	0	0	0
612	9,091	9,091	0	9,091	0
613	13,989	13,989	0	65,563	+371
618	11,974	11,831	-1	11,817	-1
619	6,524	6,524	0	6,524	0
620	9,365	16,045	+71	16,024	+71
621	8,174	7,022	-14	6,849	-16
622	33,126	28,237	-15	27,503	-17
624	16,510	18,886	+15	18,804	+14
674	16,983	16,983	0	16,983	0
675	2,258	3,650	+62	3,650	+62
Total	136,957	139,249	+2	189,504	+38

SOURCE: TLMP 1990 Habitat Capability Model. Numbers also include smolt production in lakes.

1/ % = Percent difference between 1954 and indicated year.

2/ Installation of two fish passes in Old Franks drainage in 1992 increased predicted productivity. Increase based on data from Zadina and Haddix (1990) including lakes and streams outside of National Forest System lands.

3/ Installation of the Dog Salmon River fish pass increased productivity.

4/ Installation of the Cable Creek fish pass increased productivity.

5/ Installation of the Sunny Creek fish pass increased productivity.

Research studies have been conducted on Southeast Alaska pink salmon, including the relationship between stream sediment, egg survival, and pink salmon returns to streams (Sheridan et al. 1966, Pella and Myren 1974, Sheridan and McNeil 1982). No relationship between upland management and escapement has been established. Ocean survival is influenced by food sources, predators, offshore and nearshore commercial fish harvests, water temperatures, and many other factors.

The model estimates of pink salmon habitat capability are based on estimates of available spawning habitat in the VCU streams. This was done by first determining average available pink salmon spawning area by channel type for Tongass National Forest streams that are typically used by pink salmon and not other species. These estimates were then applied to streams in each VCU that have access by pink salmon. Unlike coho salmon habitat capability estimates, pink salmon model estimates are not influenced by prescribed logging activity. This is because studies inside Southeast Alaska have not shown a direct tie between upland (land not immediately adjacent to streams) management and pink salmon numbers; therefore, effects of past management activities on pink salmon are not quantitatively evaluated with the habitat capability model.

Pink salmon

By 1995, Project Area habitat capability is predicted to increase by 63 percent for pink salmon (Table 3-11). Changes in habitat capability have only occurred through enhancement projects, such as fishways and spawning channels. Table 3-11 shows pink salmon capability from naturally available habitat, plus additional habitat resulting from the construction of fish passages. VCU's 613 and 622 contribute approximately 60 percent of the combined pink salmon habitat capability. The increase in VCU 613 is the result of assumed future successful use of two fish passes installed on the lower Old Franks drainage in 1992. VCU's 610, 620, 621, 624, and 674 contribute 33 percent of the combined pink salmon habitat capability. VCU's 611, 612, 618, 619, and 675 contribute less than 6 percent of the combined adult pink salmon habitat capability. The first group of highly productive VCU's contains two of the four largest stream drainages in the Project Area: Old Franks drainage and the Harris River.

The second group of highly productive VCU's contain Maybeso Creek and Trocadero Creek, which are two additional large stream drainages in the Project Area. Other highly productive pink salmon and anadromous fish streams in the second group of VCU's include Dog Salmon Creek, Twelvemile Creek, Indian Creek, Cable Creek, and Big Creek. Dog Salmon River, Cable Creek, and Sunny Creek fish passes also increased pink salmon habitat capability. Other factors (such as temperature and watershed disturbance) may affect habitat capability for all three species, but quantifying these effects on a Forestwide basis has not been done.

Dolly Varden

Dolly Varden char were selected to represent resident fish habitat because of the availability of data on the species' habitat requirements and their distribution over the full spectrum of resident fish habitats. Dolly Varden are also present in their anadromous form in the area. Substrate composition, water quality and quantity, and water depth and velocity are important habitat components for Dolly Varden spawning and successful incubation of eggs to fry. Dolly Varden, like coho salmon, are highly dependent on quality rearing habitat for their health, growth, freshwater survival, and marine survival. Dolly Varden juveniles spend 1 to 4 years in freshwater before migrating to saltwater as out-migrating smolts. Dolly Varden

Dolly Varden Char

Table 3-11
Pink Salmon Habitat Capability (Smolt Production) and Percent Change from 1954 to 1995 by VCU

VCU	1954	1991	%[1/]	1995	%
610	5,275,448	5,275,448	0	5,275,448	0
611[2/]	20,000	20,000	0	20,000	0
612	271,649	271,649	0	271,649	0
613	3,056,446	3,056,446	0	28,658,119[3/]	+838
618	1,142,926	1,142,926	0	1,142,926	0
619	662,348	662,348	0	662,348	0
620	1,062,817	2,585,230[4/]	+143	2,585,230	+143
621	5,014,508	5,014,508	0	5,014,508	0
622	17,321,780	17,321,780	0	17,321,780	0
624	5,748,299	6,722,587[5/]	+169	6,722,587	+169
674	5,161,215	5,161,215	0	5,161,215	0
675	595,251	962,323[6/]	+62	962,323	+62
Total	45,332,687	48,196,460	+6	73,798,133	+63

SOURCE TLMP 1990 Habitat Capability Model.

1/ % = Percent difference between 1954 and indicated year.

2/ Values based on historical spawning sources data.

3/ Installation of two fish passes in Old Franks drainage in 1992 increased predicted productivity. Increases based on data from Zadina and Haddix (1990) including lakes and streams in the Old Franks system outside of National Forest System land.

4/ Installation of the Dog Salmon River fish pass increased productivity.

5/ Installation of the Cable Creek fish pass increased productivity.

6/ Installation of the Sunny Creek fish pass increased productivity.

habitat capability, like coho habitat capability, is directly influenced by LWD recruitment. Anadromous Dolly Varden habitat needs are much like those of the coho salmon, except that some Dolly Varden may live their whole life in freshwater.

The model estimates of Dolly Varden habitat capability were made using methods similar to those for coho, with LWD abundance used as a major component in the estimate. Differences included: (1) different density values were used for Dolly Varden, (2) estimates included Class I and II streams, and (3) habitat capability is for resident fish not smolts.

Table 3-12 shows Dolly Varden habitat capability and percent change from 1954 to 1995. Dolly Varden habitat capability estimates followed those of coho salmon except they showed no beneficial effect from the addition of fish passage facilities. Project Area habitat capabilities are predicted to have decreased by 5 percent from 1954 to 1995 as a result of loss of LWD from past logging activity. The larger streams and those containing large lake systems have the highest habitat capability potential of the region. The largest habitat capability is in the Old Franks system (VCU 613), equal to about 24 percent of the total for the region. One of the reasons habitat capability is high in this system is that it has the largest lake area in the region having known Dolly Varden populations with more than three times the lake production potential of any other VCU based on the habitat capability model. Other VCU's with a high portion of the Project Area production potential are 622, 624, 674, and 620. These correspond to the system with some of the larger streams including the Harris River, Big Creek, Trocadero, Cable and Dog Salmon creeks.

Table 3-12
Dolly Varden Char Habitat Capability and Percent Change from 1954 to 1995 by VCU

VCU	1954	1991	%1/	1995	%1/
610	36,039	29,068	-19	28,041	-22
611	6,552	6,552	0	6,552	0
612	23,190	23,190	0	23,190	0
613	149,328	149,328	0	149,328	0
618	43,407	42,801	-1	42,742	-2
619	23,166	23,032	-1	23,011	-1
620	54,623	53,934	-1	53,829	-1
621	43,180	39,134	-9	38,488	-11
622	103,986	92,509	-11	90,775	-13
624	82,624	80,951	-2	80,568	-3
674	68,914	68,914	0	68,914	0
675	19,103	19,103	0	19,103	0
Total	654,112	628,516	-4	624,541	-5

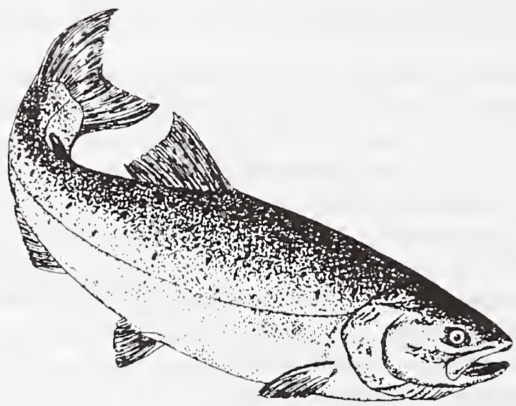
SOURCE: TLMP 1990 Habitat Capability Model with 1993 modifications. Numbers also include production in lakes in each VCU.

1/ % = Percent difference between 1954 and indicated year.

Marine Resources

Southeast Alaska's coastline consists of approximately 30,000 miles of tidal shoreline, roughly 60 percent of the total Alaskan coast. Within this region occurs a great diversity of habitats that collectively account for the complexity of Southeast Alaska's estuary and tidal environments.

The marine environment of the Project Area encompasses a wide variety of ecosystems. The shallow marine waters and associated mud flats and estuaries found in the protected coves and bays provide habitat for some important species such as dungeness crab and juvenile salmon. They are part of a complex and dynamic ecosystem that includes shrimp, flatfish marine worms, echinoderms, sponges, sea anemones, shellfish, plankton, marine algae, and other organisms. In Sunny Cove, off Cholmondeley Sound, there is a private oyster mariculture operation. This operation has two buoy line cultures in the mouth of the cove and one log suspension raft in the small bight in the cove.



Major Watersheds and Anadromous Fish Streams

The Project Area comprises part or all of approximately 160 watersheds, 51 of which are recognized by the Alaska Department of Fish and Game (ADF&G) as containing anadromous fish streams. Twenty-seven watersheds are third order or larger drainages and are considered the major watersheds in the Project Area (Figure 3-4). In general, major watersheds in the Project Area contribute the most significantly to fish production; all contain anadromous fish stocks, because they are characterized by more stable flow regimes and greater amounts of habitat than smaller drainages. Major watersheds were also subjected to Cumulative Watershed Effects (CWE) analysis (See Chapter 4). Tables 3-13 and 3-14 show the acres of previous timber harvest and riparian management area harvested by major watershed, respectively. Detailed watershed and fisheries resource descriptions for individual streams and watersheds are presented in Appendix C, Section C3.

Cable Creek (Watershed D25C, VCU 624), Harris River (Watershed C86B, VCU 622), and Maybeso Creek (Watershed C84B, VCU 610) have had previous extensive logging in the watershed that included harvest directly to the streambank (Tables 3-13 and 3-14). These practices were common during the 1950's to 1970's when this logging occurred. Several streams in the Project Area also have had major habitat improvements including fish passage facilities, habitat structure placement, and one spawning channel (Table 3-9). These improvements have included fish passage facilities installed at Old Franks Creek (VCU 613), Dog Salmon Creek (VCU 620), Cable Creek (VCU 624), and Sunny Creek (VCU 675); habitat structures have been installed in four tributaries of Cable Creek (VCU 624), Camp Creek, and Twelvemile Creek, and one now nonfunctioning pink and chum spawning channel on Indian Creek (VCU 622). Prior harvesting to streambank also occurred on other anadromous fish streams and watersheds in the Project Area. Other major streams where significant prior logging has occurred include Kina Creek (VCU 612), Lower Old Franks Creek (VCU 613), Omar Creek (VCU 618), Cabin Creek (VCU 619), Dog Salmon Creek

(VCU 620), Indian Creek, Trocadero Creek (VCU 624), and the lowermost portion of Big Creek near the estuary (VCU 674). The Maybeso watershed has been designated as an Experimental Forest where the effects of past logging practices of harvest to stream bank have been studied extensively from the 1950's and 1960's (James 1956, Meehan et al. 1969) to current times Bryant (1980, 1985).

In addition to major anadromous fish streams and watersheds, numerous smaller drainages and streams were previously identified in the Project Area. Other very small streams were identified during site visits (described below). Fish species presence or absence was determined for these smaller streams discovered during field investigations.

The lower reaches of larger streams in the Project Area, including reaches within the intertidal zone, contain the bulk of existing spawning habitat for pink and chum salmon. These species typically do not rear in freshwater; fry emigrate to saltwater shortly after emergence. Pink and chum salmon are often impeded in their upstream migration by barriers or breaks in stream gradient that pose little or no problem for other salmonids. In contrast, coho salmon and steelhead may ascend such barriers with ease and are often distributed much higher in the drainage basins. Coho salmon may occupy small streams with relatively high gradients. In Southeast Alaska, juvenile coho generally rear in fresh water for 2 years before outmigrating as smolts. Typically, drainages in the Project Area with numerous braided side channels and high amounts of instream large woody debris contain the greatest amount of rearing habitat for juvenile coho salmon.

gure 3-4
ocation of Larger Watersheds Within the Project Area

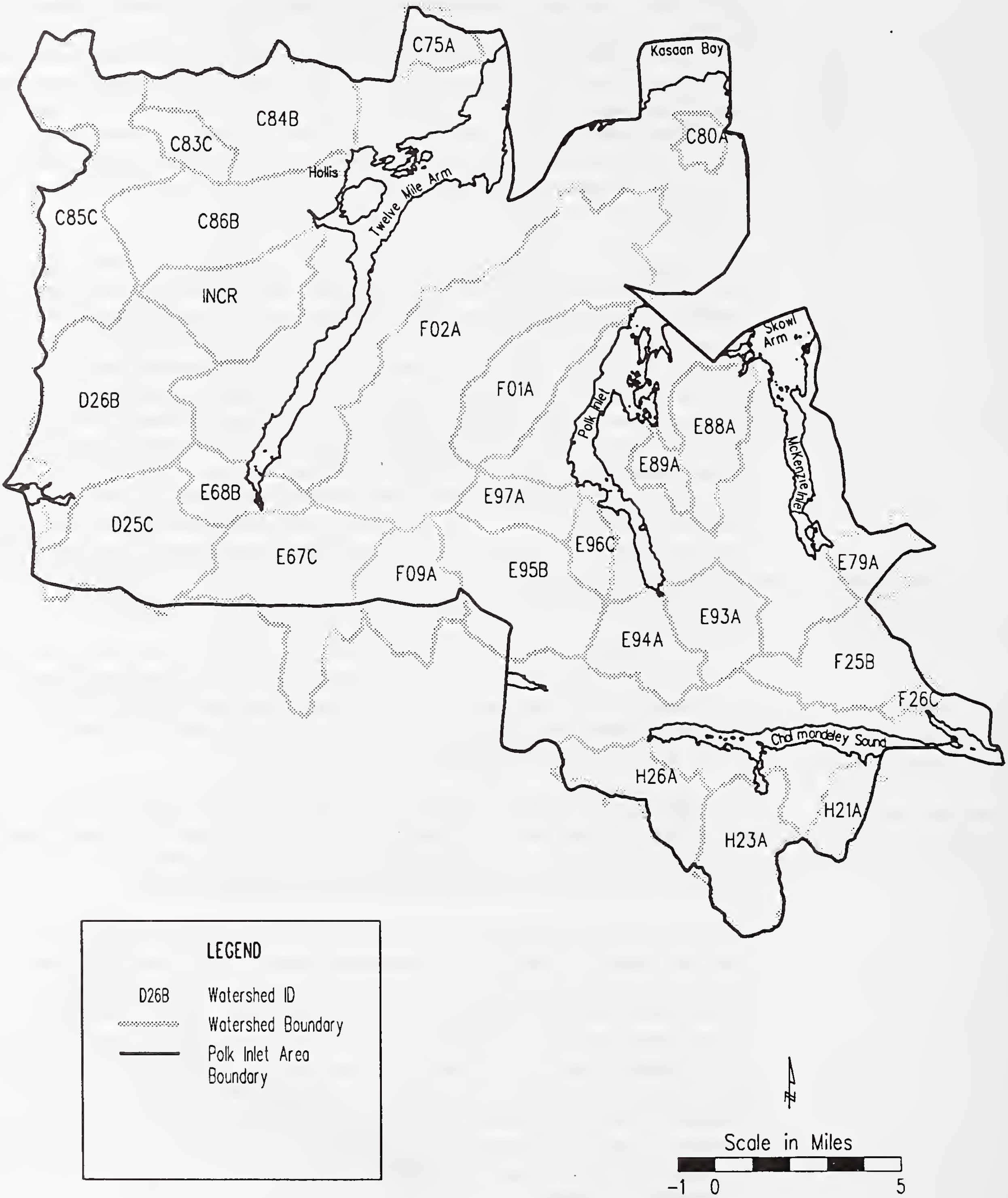


Table 3-13

Total Area Previously Harvested in Third Order[1/] and Larger Watersheds in the Polk Inlet Project Area

Name	Watershed Number	VCU	Acres Harvested	Total Watershed Acres	% of Total Harvested
Pellet Creek	C75A	611	0	1,874	0
[2/] ______	C80A	612	110	1,054	10.4
Maybeso Creek	C83C, C84B	610	2,711	10,478	25.9
Harris River	C85C, C86B	622	3,594	19,358	18.6
Cable Creek	D25C	624	3,453	7,954	43.4
Trocadero Creek	D26B	624	1,099	12,102	9.1
Twelvemile Creek	E67C	621	3,205	9,152	35.0
[2/] ______	E68B	621	612	2,861	21.4
[2/] ______	E79A	618	39	2,193	1.8
Old Tom Creek	E88A	618	0	4,200	0
Goose Bay Creek	E89A	619	217	1,324	16.4
Polk Creek	E93A	620	384	3,669	10.5
Rock Creek	E94A	620	396	4,798	8.3
Dog Salmon Creek	E95B, E96C	620	1,256	9,117	13.8
Camp Creek	E97A	620	297	2,728	10.9
Cabin Creek	F01A	619	261	5,714	4.6
Old Franks Creek	F02A	613	543	19,879	2.7
Beaver Creek	F09A	621	485	4,665	10.4
Sunny Creek	F25B, F26C	675	0	5,772	0
Cannery Creek	H21A	674	0	1,842	0
Big Creek	H23A	674	77	5,221	1.5
[2/] ______	H26A	674	0	5,810	0
Indian Creek	____[3/]	622	603	4,095	14.7
Total			19,342	144,860	13.4

SOURCE: Forest Service, Ketchikan Area, database.

1/ Third order watersheds are those that contain third order streams (see Key Terms for this section for definition of stream order).

2/ No name.

3/ No watershed number.

Table 3-14
Total Area Previously Harvested in the Riparian Management Area by Third Order and Larger Watersheds

Name	Watershed Number	VCU	Riparian Mgt. Area (Acres)	Total Riparian Mgt. Area (Acres)	% of Total Riparian Mgt. Area Harvested
1/ ______ Pellet Creek	C75A	611	0	359	0
1/ ______	C80A	612	9	78	11.5
Maybeso Creek	C83C, C84B	610	776	1,560	49.7
Harris River	C85C, C86B	622	583	1,613	36.1
Cable Creek	D25C	624	422	629	67.1
Trocadero Creek	D26B	624	88	1,264	7.0
Twelvemile Creek	E67C	621	459	640	71.7
1/ ______	E68B	621	91	355	25.6
1/ ______	E79A	618	24	473	5.1
Old Tom Creek	E88A	618	46	805	5.7
Goose Bay Creek	E89A	619	13	161	8.1
Polk Creek	E93A	620	39	499	7.8
Rock Creek	E94A	620	23	725	3.2
Dog Salmon Creek	E95B, E96C	620	214	1,351	15.8
Camp Creek	E97A	620	72	363	19.8
Cabin Creek	F01A	619	0	323	0
Old Franks Creek	F02A	613	245	3,028	8.1
Beaver Creek	F09A	621	49	265	18.5
Sunny Creek	F25B, F26C	675	0	898	0
Cannery Creek	H21A	674	0	372	0
Big Creek	H23A	674	21	618	3.4
1/ ______	H26A	674	0	272	0
Indian Creek	______ 2/	622	7	467	1.5
Total			2,405	17,118	14.0

SOURCE: Forest Service, Ketchikan Area, database.

1/ No name.

2/ No watershed number.

Steelhead (the anadromous form of rainbow trout) are found primarily in the following streams in the Project Area: Maybeso Creek (VCU 610), Kina Creek (VCU 612), Old Franks Creek (VCU 613), Camp Creek (VCU 620), Twelvemile Creek (VCU 621), Harris River (VCU 622), Twentymile Creek (VCU 622), Cable Creek (VCU 624), Gulch Creek (VCU 624), Trocadero Creek (VCU 624), and Sunny Creek (VCU 675).

Sockeye salmon are found mainly in drainages containing lakes. Sockeye inhabit the following streams in the Project Area: Old Franks Creek (VCU 613), Old Tom Creek (VCU 618), Cabin Creek (VCU 619), Dog Salmon Creek (VCU 620), Big Creek (VCU 674), Portage Creek (VCU 674), and Sunny Creek (VCU 675).

Kokanee (the nonanadromous form of sockeye salmon) are found in the following lakes which are all located in VCU 613: Lake Mary, Old Franks Lake, and Upper Old Franks Lake. Both cutthroat and Dolly Varden char may be present as anadromous forms, or as resident populations in lakes and reaches of streams not generally used by anadromous species. Resident rainbow trout are also present, and have been introduced into at least one lake drainage (Old Franks). Although there are no known chinook (king) salmon streams in the Project Area, they do occur in adjacent marine waters.

Fish Enhancement Opportunities

Meeting future output goals for anadromous fish through identification of appropriate fisheries enhancement projects is an important management objective. Timber harvest activities may fund habitat improvement projects through Knudsen-Vandenburg (KV) funds. The KV funds are made available from timber sale receipts and may be used for the improvement of nontimber resources.

Potential Barrier Removal Opportunities

In addition to the existing and planned stream-enhancement projects shown in Table 3-9, the following barrier-removal opportunities were identified during field work in 1992. These opportunities may require additional evaluation in the field. These improvements may be funded through KV funds.

Unit Number 612-224—A Class III stream located along the northern unit boundary has a 10-foot high debris jam reinforced with boulders that potentially limits upstream movement of coho salmon. The barrier is removable. However, available upstream rearing habitat for coho is limited. Although the stream is approximately 6 feet wide (even at low flow) where it intersects the western unit boundary, it becomes much narrower and steeper approximately 400 to 500 feet upslope. Overall potential for enhancement is low.

Unit Number 613-216—The stream flowing along the northern boundary of the unit is Class I up to a small partial barrier consisting of a 10-foot-long section of bedrock (40 percent grade); above this point the stream is Class II. Above the Class II section and approximately in the middle of the unit, there is another barrier consisting of a 15-foot-high bedrock waterfall. Fish habitat above this second barrier is excellent. This section of stream is 3 to 5 percent grade with abundant cobbles. Overall potential for enhancement is moderate.

Unit Number 620-325—The stream on the western unit boundary is a Class I stream with excellent coho-rearing habitat. Numerous juvenile coho salmon were seen below the culvert where the road crosses this stream. The culvert could be a partial barrier for upstream coho migration at some flows. Approximately 600 feet south of the road, and outside the unit, there is a 6-foot-high bedrock waterfall. Above the falls, the stream flattens out and has excellent habitat for coho rearing, including numerous pools with LWD. The 6-foot bedrock barrier is removable. Overall potential for enhancement is moderate. Culvert redesign and maintenance may be needed in conjunction with barrier removal for optimal results.

Addition of LWD to Enhance Fish Habitat

Several locations in the Project Area where prior timber harvest to streambank has occurred now have low potential for LWD recruitment into Class I streams. Over time, the habitat value for salmonid production has declined or will decline because of loss of pool depth and overhead cover provided by LWD from the time of harvest of stream- side old growth. For

many streams, it will take about 90 to 130 years from the time of harvest of streamside old growth for second growth to provide additional LWD in streams that exceed the loss of that produced by the original old-growth forest (TLMP 1991a). KV funds or other available funding sources could be used to enhance fish habitat through the placement of LWD in selected reaches of Class I streams in drainages where timber harvest units are proposed during this entry (Mitigation Measure F10). The following streams have been identified for enhancement.

Cable Creek—Optimum benefits from enhancement would occur on the section of Cable Creek below Hydaburg Road. The target reach is approximately 0.5 mile long, and extends into the intertidal zone.

Beaver Creek—There are two reaches that are recommended for enhancement: from the Trocadero Trail crossing to approximately 900 feet upstream of the trail crossing, and the 0.5-mile-long reach upstream of the main Hydaburg Road.

Snipe Creek—The lower 0.5 mile of Snipe Creek has already been treated. Further enhancement should target the next 1.5 miles upstream.

Twelvemile Creek—The lower 4 miles of Twelvemile Creek would benefit from the addition of LWD.

For all reaches, LWD consisting of intact boles with rootwads would be preferred when available; however, they may be adequate in some situations. LWD used for enhancement should be the appropriate size (diameter) and species for the particular stream, and should be anchored in place with cables whenever possible.

Two other areas that would benefit from addition of LWD are the Harris River and Maybeso Creek. However, this entry has no units proposed within these drainages.

Vegetation and Timber Resources

Sitka spruce

Key Terms

Commercial forest land (CFL)—land that supports continuous crops of timber (20 cubic feet/acre of tree growth annually, or currently having at least 8 MBF/acre).
Desired future condition or goal—a concise statement that describes a desired future condition normally expressed in broad, general terms that are timeless, in that there is no specific date by which the goal is to be achieved (36 CFR 219.3)
Duff layer—vegetative material covering the mineral soils in forests including the fresh litter and well-decomposed organic material and humus.
Even-aged—management techniques that result in the creation of stands in which trees of essentially the same age grow together.
Management stand—a stand of trees in which stocking level control is applied to achieve maximum growth or other resource objectives.
MBF—thousand board feet.
MMBF—million board feet.
Overstory—the portion of trees in a forest that forms the uppermost layer of foliage; also called the canopy.
Partial cut—method of harvesting trees where any number of live trees are left standing in any of various spatial patterns; not clearcutting.
Regeneration—the process of establishing a new crop of trees on previously harvested land.
Reserved—lands that have been withdrawn from the timber base by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.
Uneven-aged—management techniques that results in the creation of stands that exhibit a range of diameter or age classes.
Windfirm—trees that have been exposed to the wind throughout their life and have developed a strong root system or trees that are protected from the wind by terrain features.
Windthrow—the act of trees being uprooted by the wind.

Plant Communities

The Polk Inlet Project Area is a mosaic of coniferous forest interspersed with alpine tundra, muskeg (bog), shrubland, estuarine, and beach fringe plant communities. Within the Project Area, plant associations have been classified into forested plant associations that are based upon the potential climax plant community (DeMeo 1989). The climax plant community is the result of the interaction between landform, climate, soil, and time. All forested plant associates having the same climax tree species are referred to as a series and are named based upon the climax tree species.

Forested Plant Communities

Sitka Spruce Series

Plant associates in this series are dominated by Sitka spruce (*Picea sitchensis*) in the overstory. Western hemlock (*Tsuga heterophylla*), the principal co-dominant, may be common, but provides less than 40 percent cover and is overtopped by the spruce. Other tree species are uncommon. This series is located primarily at low elevations in well-drained alluvial fans and riparian areas or avalanche chutes. It is also found at mid-elevations on steep mountain slopes adjacent to channels, along snow avalanche paths, on slopes subject to masswasting, and on

sites subject to annual deposits of loess. Soils are generally deep, poorly developed, and well drained, with a thin organic layer on the surface. Soil disturbance caused by flooding, salt spray, and avalanching allow the spruce and shrub species, such as devil's club (*Oplopanzx horridum*), blueberry (*Vaccinium* spp.), and salmonberry (*Rubus spectabilis*) to maintain dominance on these sites.

Seedlings of both western hemlock and Sitka spruce series are present, but conditions favor spruce regeneration. This series is generally highly productive and the heights of mature spruce often exceed 150 feet. These communities seem to represent stable late-seral or climax units (Viereck et al. 1992).

Western hemlock

Western Hemlock Series

Plant associates in this series are dominated by western hemlock in the overstory. Sitka spruce may be present but provides less than 25 percent of the overstory cover. The presence of Sitka spruce is in relation to the frequency of disturbance. Other conifer species are uncommon. The shrub layer is dominated by blueberry and rusty menziesia (*Mengiesia ferruginea*); devil's club can be a major component in wet areas. Plant productivity is generally high, with mature hemlock often exceeding heights of 125 feet.

The western hemlock series generally occurs from lowlands to the subalpine on several landforms including inactive alluvial fans and floodplains, footslopes, and steep mountain slopes. Soils usually are deep and well drained with a thin (4- to 6-inch) forest floor layer. These communities are usually stable (climax) (Viereck et al. 1992).

Mountain Hemlock Series

Mountain hemlock (*Tsuga mertensiana*) is the dominant overstory tree in these plant associates, with Sitka spruce and Alaska yellowcedar (*Chamaecyparis nootkatensis)* occurring to a lesser degree. The mountain hemlock series is generally located on cold, high-elevation slopes above the western hemlock series. This series may also occur to a minor extent at lower elevations in frost pockets and on steep, north-facing mountain slopes. Western hemlock may occur in the transition zone at the lower elevations of these communities. Blueberry is the common shrub species. Site productivity is limited by the shorter growing season and by generally shallow, poorly drained soils. These communities are thought to be climax. Because they are rarely logged and rarely affected by windthrow, secondary succession is not well understood. Because of the dense shrub layer and poor growing conditions at these sites, they probably require substantial time to return to climax condition after disturbance (Viereck et al. 1992).

Mixed Conifer Series

Dominant trees in this series include mountain hemlock, western hemlock, western redcedar (*Thuja plicata*), and Alaska yellowcedar. This plant series is generally located in uplands, often near muskegs, but is also found on nearly level sites on hilltops, benches, lowlands, and valley bottoms. Blueberry and rusty menziesia are the dominant shrub species.

These communities are stable and slow to change. They have limited productivity because of poor soil drainage, shallow soil, or both. Because of the poor site, no tree species typically has a competitive advantage over another species. Since tree growth on these sites is low, recovery from severe disturbance likely would also be slow (Viereck et al. 1992).

Western Hemlock-Yellowcedar Series

Dominant overstory species in this series are western hemlock and yellowcedar. Sitka spruce is uncommon and mountain hemlock occurs in minor quantities. Hemlock seedlings are abundant

while Alaska yellowcedar seedlings are uncommon. This series can occur at all elevations below the subalpine zone, but is primarily found on stable mountain slopes, hillslopes, and footslopes where drainage or root growth are impeded. Erosive surface or subsurface waterflow does not occur. Blueberry is the dominant shrub with rusty menziesia common. Soils are mineral and may be either deep and somewhat poorly drained or shallow and well drained. The most common restricting layers of shallow soils are bedrock, compact till, and compact ash. Soils of localized depressions generally have a thick organic horizon. Site productivity is moderate.

These communities are thought to be climax. When sites supporting these communities are logged, they tend to come back to blueberry and rusty menziesia if the soil is not seriously disturbed, and to Sitka alder (*Alnus sinuata*) and salmonberry if the soil has been seriously disturbed (Viereck et al. 1992).

Shore pine

Western Hemlock-Western Redcedar Series

The overstory of this series is dominated by western hemlock, with redcedar commonly occupying 10 to 25 percent of the forest canopy. Other tree species of significance include Alaska yellowcedar and mountain hemlock. Blueberry is a common shrub species.

This series is most common on moderately to highly productive sites in rolling hill country, low hills, and mountain slopes. The soils may be organic or mineral.

These communities appear to be climax. After logging or other disturbance, sites supporting these communities often go through a stage dominated by western hemlock, with small proportions of Sitka spruce and frequently a shore pine (*Pinus contorta var. contorta*) component (Viereck et al 1992).

Shore Pine Series

The shore pine series is a low-productivity series with overstory dominated by shore pine. Scattered Alaska yellowcedar, western redcedar, and mountain hemlock also may be present in the overstory. Understory vegetation is diverse and often includes bog species such as crowberry (*Empetrum nigrum*), bog blueberry (*Vaccinium uliginosum*), and Labrador tea (*Ledum groenlandicum*).

This series can be located at all elevations below the subalpine zone in the transition from mixed conifer to nonforest muskeg. These sites are either level or gently sloping and most commonly occur on lowland plateaus with compact till. Soils are deep, organic, and poorly drained. The shore pine series are climax communities.

Nonforested Plant Communities

Nonforested plant communities occur in a variety of locations including estuaries, riparian areas, muskegs, alpine meadows, and alpine lichen rock outcrops. Nonforested plant communities are described below.

Estuary Tidal Flats

These are wetlands inundated by high tides and consist primarily of sedges, red fescue (*Festuca rubra*), and sea milkwort (*Glaux maritima*). Also included are areas on low terraces dominated by blue joint (*Calamagrostis canadensis*) and sedges.

Shrub Riparian Areas

These areas are located in highly active, frequently flooded floodplains. Salmonberry, stink current (*Ribes bracteocum*), devil's club, and ferns are the dominant vegetation.

Muskegs (Peatlands)

Muskegs include boggy areas characterized by stunted yellowcedar and shore pine, along with sedges and other bog vegetation. The water table is at the surface.

Alpine Meadows

Alpine meadows are dominated by cassiope (*Cassiope* spp.) and mixed forbs, including mountain heath (*Phyllodoce* spp.). These meadows are found on steep, well-drained rock outcrops at high elevations.

Forest Site Classification

Site class is a measure of the relative productive capacity of an area for tree growth. This measure is used to predict future timber yields and to set silvicultural priorities.

The two most common methods for determining site class are based on tree height and age, and based on soils. The site index method, is based on the height and age of trees in a stand. An index age of 50 or 100 years is used in constructing height-age site curves. The site index is based on the expected height to which a tree will grow within a given number of years (in this case 50 years). It is difficult to obtain site index for old-growth timber stands as it is hard to measure age accurately and trees over 300 years old virtually cease height growth.

The soil-based method depends on soil-site relationships. Estimates of site productivity in old-growth stands can best be obtained from examination of the soil. Soil-site relationships have been developed for Southeast Alaska, based primarily on depth and drainage of soil and parent material (Ruth and Harris 1979). These sites indices, shown in Table 3-15, have been divided into four site classes and incorporated into a data layer in the Forest Plan database.

Table 3-15
Site Class Descriptions

Site Class	Site Index (Height in ft. @ 50 yrs)
1	0 to 40
2	41 to 60
3	61 to 80
4	80 plus

SOURCE: Forest Service, Ketchikan Area, database.

Damaging Agents

As living organisms, trees are subject to aging and eventual death. These are natural processes in the renewal and continuation of the forest. Various living and nonliving agents, including fires, insects, disease, and animals, alter the natural aging and death process of trees and stands (Ruth and Harris 1979). The occurrence of insect, disease, and animal damage was noted, by plot, during the stand examination. The most prevalent damaging agents are discussed below. Insect and animal damage were not found to be significant.

Table 3-16 summarizes the acres by site index and by VCU for all nonencumbered Nation Forest System land in the Polk Inlet Project Area, including the Maybeso Experimental Forest and the Old Tom Creek Research Natural Area.

Table 3-16
Acres in Each Site Class (Productivity Group) by VCU, Excluding Encumbered Lands

	Site Class					
VCU	Unclassified	1	2	3	4	Total
610	1,726	1,627	1,196	154	6,205	10,908
611	0	1,971	480	911	2,478	5,840
612	0	380	2,136	1,583	1,309	5,408
613	13	3,872	7,128	2,685	4,667	18,365
618	0	2,621	3,790	7,571	3,040	17,022
619	0	1,319	2,188	2,710	2,261	8,478
620	0	4,029	6,612	7,513	5,170	23,324
621	6,460	2,907	3,782	5,138	4,936	23,223
622	7,396	1,373	3,848	109	4,588	17,314
624	7,870	875	2,338	665	2,491	14,239
674	0	3,576	6,974	4,925	2,468	17,943
675	0	1,431	2,139	2,176	1,124	6,870
Total	23,465	25,981	42,611	36,140	40,737	168,934

SOURCE: Forest Service, Ketchikan Area, database.

Fire

Although fire is rarely a factor in the moist forests of Southeast Alaska, it can occur when warm, dry climatic conditions persist. Sometime around 1910, a fire burned an area south of Kasaan Bay in VCU 613. From the air, one can identify the second-growth timber that marks the limits of the fire, which has been estimated to cover an area in excess of 1,000 acres.

Insects

In the late 1980's, a portion of the Project Area experienced infestations of black-headed budworms and hemlock sawflys. The west side of Polk Inlet north of the Forest Service camp was particularly hard hit. Climatic conditions and harvesting the infected trees eventually killed off the insect population.

Hemlock Sawfly

The hemlock sawfly (*Hymenoptera:Diprionidae*) occurs throughout Southeast Alaska. Sawflies are more abundant and outbreaks are longer lasting in southern Southeast Alaska where widespread damage is usually confined to the area south of Frederick Sound, especially along Clarence Strait. Its primary host is western hemlock.

Most sawfly outbreaks do not cause tree mortality, but some trees are top-killed temporarily reducing growth. Tree mortality becomes more apparent when sawfly and black-headed budworm populations occur at the same time. This is due to the feeding habits of the two defoliators: the budworm feeds on the current year's foliage, while sawflies consume old foliage; together, they cause complete defoliation. Sawfly larvae cannot successfully complete development on the current year's foliage.

Natural controls usually reduce epidemic sawfly populations within a few years. Wetter than normal summers help to reduce sawfly populations by promoting fungal growth. Fungi readily infect and kill sawfly larvae under warm, damp conditions. Likewise, low summer temperatures help to reduce sawfly populations (Forest Service 1985b).

Black-headed Budworm

The black-headed budworm (*Lepidoptera:Tortricidae*) occurs primarily in Southeast Alaska, but occasionally in forests of Prince William Sound and southwestern Alaska. Western hemlock (preferred), and Sitka and white spruce are its hosts.

The black-headed budworm is one of the most destructive forest insects in coastal Southeast Alaska. During the 1950's, almost one-third of the net volume of timber was lost on some Southeast Alaska hemlock sites due to budworm defoliation. Localized outbreaks have occurred sporadically since then. Feeding larvae strip host foliage, reducing growth and causing top kill and, at times, tree mortality.

Populations of this species are characterized by sporadic spectacular increases followed in two to three years by equally rapid declines. Adverse weather conditions may be an important controlling factor for Southeast Alaska budworm populations (Forest Service 1985b).

Disease

Dwarf Mistletoe

The occurrence of dwarf mistletoe in mature and overmature western hemlock stands is widespread throughout Southeast Alaska and the Polk Inlet Project Area. It is one of the most destructive diseases in old-growth forests of Southeast Alaska. In general, dwarf mistletoe reduces the vigor and growth rate of its hosts so that infected trees require a longer time to reach merchantable size and often produce lower quality timber (Boyce 1961). Dwarf mistletoe often produces cankerous swellings at the point of infection. The cankers may offer an entrance for wood-destroying fungi, which could lead to significant heart rot. Dwarf mistletoe is prevalent throughout the Project Area and may be one of the agents responsible for the high incidence of heart rot in overmature hemlock stands. Only a few high concentration areas were observed in the Project Area, as evidenced by heavy brooming.

Hemlock Fluting

Even though stands with fluted hemlock trees exist throughout Southeast Alaska, they generally occur on uplifted coastal beaches and alluvial flood plains. Branch location and activity determine the occurrence of flutes on the trunk. Flutes generally start where branches grow out from the stem and after the decline of branch activity from shading slows radial growth beneath the branch. Flutes from vertically aligned branches coalesce and produce long grooves that spiral downward. As branch stubs decay, flutes become overgrown.

In a windy environment, fluted trees may be more stable than cylindrical trees. With a broader base and pronounced buttressing, fluted trees are probably better adapted to the shallow soil and gusty wind conditions of Southeast Alaska. The largest buttresses on leaning trees occur in the direction of the lean, indicating that buttresses are a gravity response to mechanical stresses.

Fluted logs are difficult to debark for pulping; moreover, sawmills report a reduction in usable volume from fluted logs because flutes and bark seams can extend nearly to the center of the log.

Planting of Sitka spruce is recommended for areas where fluting is a serious problem in the previous stand. Manipulation of stand structure by thinning will also reduce the severity of fluting. Western hemlock trees in suppressed or intermediate positions in the canopy exhibit mild degrees of fluting. Thinning to remove fluted hemlock from the overstory will create a stand with Sitka spruce as dominates and relatively cylindrical western hemlock as subdominates (Julin and Farr 1989).

Yellowcedar Decline

Yellowcedar decline is an affliction that causes considerable mortality of yellowcedar in Southeast Alaska. Mortality can be in small patches or expansive areas. Affected yellowcedars may die quickly (over 2 or 3 years), or may die slowly over a 15-year period or longer with crowns slowly thinning. The cause of yellowcedar decline is not completely understood, but is generally associated with boggy conditions, usually near muskegs (Holsten et al. 1985). The primary cause of mortality is unknown, and no single factor has been shown to be primarily responsible (Hennon et al. 1990).

There are a considerable number of afflicted yellowcedar stands within the Polk Inlet Project Area. Many of these stands were not part of the suitable land base (less than 8 MBF per acre) and, therefore, were not examined.

Decay Fungi

Decay caused by heart and root-rotting fungi is probably the greatest single cause of disease-related volume loss in Alaska (Holsten et al. 1985), and probably also within the Polk Inlet Project Area. In many old-growth stands, annual volume loss of wood through decay may equal or exceed growth. On average, only about 31 percent of the gross board foot volume in old-growth stands is estimated to be usable as sawtimber (Ruth and Harris 1979). Some of the decay-causing fungi within the Project Area are *Fomitopsis pinicola* (brown rot fungus of Sitka spruce and western hemlock, *Armillaria mellea* (white rot fungus of all Southeast Alaska tree species), and *Heterobasidion annosum* (white rot fungus of western hemlock and Sitka spruce).

Windthrow

Wind damage is prevalent in timber stands throughout Southeast Alaska where winds normally sweep through the forests causing breakage and windthrow. One study indicated that wind was responsible for approximately one-fourth of the annual tree mortality in Southeast Alaska during a 7-year period (Hutchison and LaBau 1975). The rooting habits of western hemlock and Sitka spruce make these species susceptible to windthrow; both species are shallow rooted and depend on mutual support for wind resistance. As a result, wind is the major disturbance factor in Southeast Alaska ecosystems altering forest structure.

Wind tends to increase the diversity of the forest. Gaps or openings in the forest canopy occur when individual trees or small groups of trees blow down. Small gaps provide light and growing space, which allow tree regeneration and understory plants to become established and grow rapidly. When large gaps are created, tree regeneration develops into even-aged forest stands. Eventually these stands are affected by blowdown, which allows new tree regeneration to become established. In this way, the pattern of blowdown plays a major role in determining the structure of old-growth forests (Harris 1989).

The wind created diversity of the forests in Southeast Alaska affect deer and fish habitat. Wind provides a winter source of food for deer by making available material from tree crowns. Branchlets are clipped off by the wind, branches are blown down and foliage becomes accessible when trees are blown down. Wind may also affect fish habitat when trees are blown into streams or when streamside shade is removed (Harris 1989).

Undisturbed forest watersheds are generally less likely to suffer windthrow damage than watersheds in which harvesting has taken place. Undisturbed timber stands have reached a certain degree of wind stability and tend to rely on each other to keep the main force of the wind above the forest canopy. However, once the stand structure is altered through harvesting or natural factors, wind is able to exert its full force against an edge of the stand and the stand becomes more susceptible to damage. Although there are probably no stands that are immune from windthrow damage, some are more susceptible than others. Although forest managers probably will never be able to eliminate wind damage completely, much can be done to reduce or minimize damage (Harris 1989). An important consideration in the planning process is what the effect of harvesting a particular unit will have on the windfirmness of adjacent stands. Common traits of windfirm stands and windthrow-susceptible stands have been documented by (Harris 1989). These are outlined in Table 3-17.

Topographic features also influence windthrow probability. The following features may result in decreased windfirmness.

- Westerly or easterly aspects where storm winds are accelerated around ridges
- Southerly aspects exposed to onshore winds
- Sideslopes or flats parallel to water channels oriented in a general northwest-southeast direction, especially along the west side of channels-flats and valley bottoms of heads of inlets or bays exposed to southerly winds
- Small islands, promontories, or slopes at constrictions of channels with open water to windward
- Low ridges or upper leeward slopes.

Table 3-17
Traits of Windfirm and Windfirm-susceptible Stands

Trait	Windfirm Stands	Susceptible Stands
Age	Young	Old
Age Structure	Even-aged	Uneven-aged
Defect	Little defect	Large amounts of defect
Height	Short	Tall
Stocking	Open stocking on less productive sites, muskeg or scrub stands	Dense stocking on productive sites
Species Composition	Have a high percentage of cedar and hardwoods	Adjacent to recent openings
History	Intact with little evidence of recent openings	Previously damaged by blowdown
		Even-aged pole or young sawtimber opened by thinning or partial cutting

SOURCE: Harris 1989.

A windthrow risk-rating system based on aspect (topography), existing blowdown (history), stand density (stocking), and other factors (defect, topography, etc.), was applied during field work on harvest units in the Polk Inlet Project Area. During the timber stand examination, information was gathered to rate potential harvest units as high, medium, or low. These ratings are documented in the silvicultural prescriptions developed for each harvest unit. Of 168 rated potential harvest units, 43 were given a high windthrow-risk rating, 57 were given a medium rating, and 68 were given a low rating (Mehrwein et al. 1993).

Silvical Characteristics of Forest Trees

Western hemlock and Sitka spruce are the two most prolific conifer species found in the Project Area. These two species are also the most frequently harvested for commercial purposes. They can occur anywhere between sea level and timberline, but grow best on well-drained valley bottoms and lower slopes.

Western Hemlock

This species is classified as very tolerant and is the most common conifer species in the Project Area. It dominates the reproduction of the old-growth forest. Western hemlock thrives on a wide variety of seedbeds, including rotten stumps and logs. It produces a long, clear, symmetrical bole and has a shallow, wide-spreading root system. The crown is short, open, and pyramidal, and its terminal leader is usually drooping. An abundance of both soil and atmospheric moisture is required for rapid growth.

Western hemlock begins to produce an abundance of seed after 25 to 30 years of growth, and large crops are borne every 2 or 3 years thereafter. Nearly any soil provides a satisfactory seedbed, and when supplied with an abundance of moisture, germination is usually high. Partially rooted stumps and logs are often covered with hemlock seedlings. Fresh mineral soil, moist duff, or even sphagnum peat are suitable for seedling development. This species often usurps cutover areas formerly occupied by other species. The trees are quite tolerant throughout life. The largest trees rarely attain an age of more than 500 years. Western hemlock is susceptible to fire injury, and butt rot is prevalent in over-mature trees (Harlow and Harrar 1958).

Mountain hemlock

Sitka Spruce

The crown of Sitka spruce is short and rather open, and the upper, usually ascending branches end in loosely hanging branches. The bole is long, cylindrical, and often clear for 100 feet of its length and is supported by a very shallow, widespreading root system. Sitka spruce produces an abundance of seed nearly every year with especially large crops released every 2 to 3 years. Germination is good (up to 60 or 70 percent), and seedlings are easily established on a variety of soils. Growth is fairly rapid (Harlow and Harrar 1958).

Sitka spruce responds well to disturbance and establishes best on bare mineral soil. This species is intermediate in shade tolerance and demands more light than western hemlock (Harris and Farr 1974). The species is both larger and more valuable than Western hemlock. The largest trees are found on deep loams of high moisture content. Sitka spruce is an important source of high-grade wood pulp and lumber.

Mountain Hemlock

This species is found between sea level and timberline and often replaces western hemlock at higher elevations. At lower elevations, mountain hemlock is often found on poorer sites and on the fringes of muskegs.

Although one of the largest of alpine trees, mountain hemlock is often a low, sprawling, or even prostrate shrub on wind-swept ridges near timberline. Forest trees, however, average 75 to 100 feet in height and are characterized by a shallow root system which supports a long,

clear or limby bole with a narrow pyramidal crown of drooping branches. Trees on the sides of canyons and on very steep slopes are commonly pistol-butted. In open situations, particularly in high alpine meadows, the boles are excessively tapered. The best stands of this species are found on moist slopes, flats, and heads of ravines of northerly exposure.

Seed is borne at an early age, and regular crops are produced annually after 25 to 30 years of growth. The seeds exhibit transient vitality, but under favorable conditions germination is good either in moist duff or on bare mineral soil. Seedlings are very tolerant, comparing favorably with those of western hemlock. Dense shade causes suppression, but the trees recover rapidly upon being released. Growth is considered slow (Harlow and Harrar 1958). The quality of wood from mountain hemlock is similar to that of western hemlock.

Western Redcedar

/estern redcedar

This species is found starting at sea level but drops out before timberline. Western redcedar typically occurs in combination with Alaska yellowcedar, shore pine, and western hemlock on poorly drained organic soils. A shallow, wide-spreading root system supports a broadly buttressed, often fluted base and rapidly tapering bole. The crown is typically irregular and is usually composed of numerous, more or less horizontal or drooping branches which bend upward at the end to form a distinct hook.

Western redcedar grows best on well-drained sites, but also inhabits moist flats and slopes, the banks of rivers and swamps, and is even found in bogs. It seldom occurs in pure stands but often constitutes up to 50 percent of mixed forests.

Large crops of seed are produced at intervals of from 3 to 4 years, although small amounts are usually released locally every year. Germination is exceptionally good in moist humus, and a fairly large number of seedlings may be found on cutover areas. A light shade favors seedling development, and subsequent growth is initially fairly rapid (Harlow and Harrer 1958).

Pecky heart rot is commonly found in overmature trees, and almost all very old trees are hollow-butted. Western redcedar wood is extremely durable. This species is well suited for boat construction, house siding, and shingles.

Yellowcedar

This species is commonly found on sites that are poorly drained, often over hard pan or shallow soils over bedrock. Yellowcedar is less shade tolerant than hemlock or spruce. It usually develops a broadly buttressed, often fluted base and rapidly tapering bole which is often clear for about one-half of its length. The conical crown is composed of numerous drooping branches with long, pendulous, flattened sprays of foliage.

Yellowcedar generally produces a small amount of seed yearly, and large crops are released only at irregular and infrequent intervals. The seeds exhibit transient viability, and the percentage of seedling survival is never very great. The seedling, once it has become established, continues to grow very slowly but persistently (Harlow and Harrar 1958).

This species is a minor, but valuable commercial tree in Southeast Alaska. Yellowcedar produces high value lumber for millwork and boat construction.

Shore Pine

This species is common in open muskeg and on benches near lakes. It is shade intolerant, and develops best in the better-drained borders between muskeg and hemlock stands. It is characterized by a short, often contorted bole and a dense, irregular crown of twisted branches, many of which extend nearly to the ground. The root system is deep, widespreading, and includes a

persistent taproot, even when growing in bogs or muskegs. The tree is one of the first to invade peat bogs.

Shore pine is seldom harvested commercially because it is rarely saleable (Harlow and Harrar 1958).

Red Alder

This species grows quite rapidly and is commonly found along beaches, streams, and on lands that have been recently disturbed, such as landings and roads (Ruth and Harris 1979). In dense stands, it develops a clear, symmetrical, but slightly tapered bole, with a shallow and spreading root system and a narrow, domelike crown. The crown of open-grown trees, however, is broadly conical and often extends nearly to the ground. It grows best on moist rich loamy bottomlands, slopes, and benches, although it commonly attains tree size on gravelly or rocky soils.

Red alder is one of the first trees to appear on logged areas but never forms a permanent forest; rather, it prepares the soil for other species, first by building up an organic litter on the forest floor, and then by increasing the nitrogen content of the soil through nitrogen-fixing nodules which are attached to its roots. It is a prolific annual seeder, and the seeds germinate equally well on either organic or mineral soils. Seedlings are moderately tolerant and grow quite rapidly (Harlow and Harrar 1958).

Silvicultural Systems

The first step in the selection of an appropriate site-specific silvicultural systems is the determination of the range of acceptable treatments. An acceptable treatment is one that is not only feasible but has a reasonable expectation of achieving sound silvicultural objectives. Such objectives typically include species composition, stand density, growth rate, insect and disease control, and overstand condition and development.

The next step is to use the Forest Plan, management concerns, and public issues to refine site-specific objectives. It is possible that more than one silvicultural system may be prescribed for the same site depending upon the alternative in question.

The names given to silvicultural systems describe the method of regeneration cutting used to replace the existing stand. Silvicultural systems are grouped into even-aged and uneven-aged systems, depending on the age structure created by regeneration cut. Both even- and uneven-aged silvicultural systems are approved for use in the Polk Inlet Project Area.

Even-aged Systems

Even-aged systems produce distinct successional stages. Within a managed forest where even-aged systems are being used, stands composed of trees with similar age and size are distributed throughout. Diversity within stands is at a minimum, but moves toward maximum diversity between stands. Clearcutting, the most common even-aged system prescribed in Southeastern Alaska, has the following beneficial characteristics:

- The frequency of site disturbance is minimized.
- The risk of stand damage to the residual stand is eliminated.
- The risk of blowdown to the residual stand is eliminated.

- Natural regeneration is usually adequate and Sitka spruce gains a competitive advantage. This advantage occurs because clearcutting produces the greatest forest floor disturbance which provides the best seed bed for Sitka spruce and it removes the greatest amount of advanced hemlock regeneration during the logging process.

- It provides an effective means of controlling dwarf mistletoe provided the clearcut is approximately 20 acres or larger. This is because the rate of spread from adjacent infected stands will proceed at a very slow rate into a regenerated clearcut unit. In an uneven-aged system, the infected overstory trees will likely still remain in the stand and be present to infect the regeneration.

- It maximizes the amount of solar radiation that reaches the forest floor. The increased solar radiation increases the biological decomposition of heavy organic accumulations, which improves site productivity.

- Logging costs are generally lower than with other systems.

- It requires less road development for the same volume of timber.

Some disadvantages to clearcutting are:

- Distribution of seed is uneven leaving some areas overstocked and other areas possibly understocked.

- The risk of blowdown along cutting boundaries is increased.

- It is aesthetically the least desirable system.

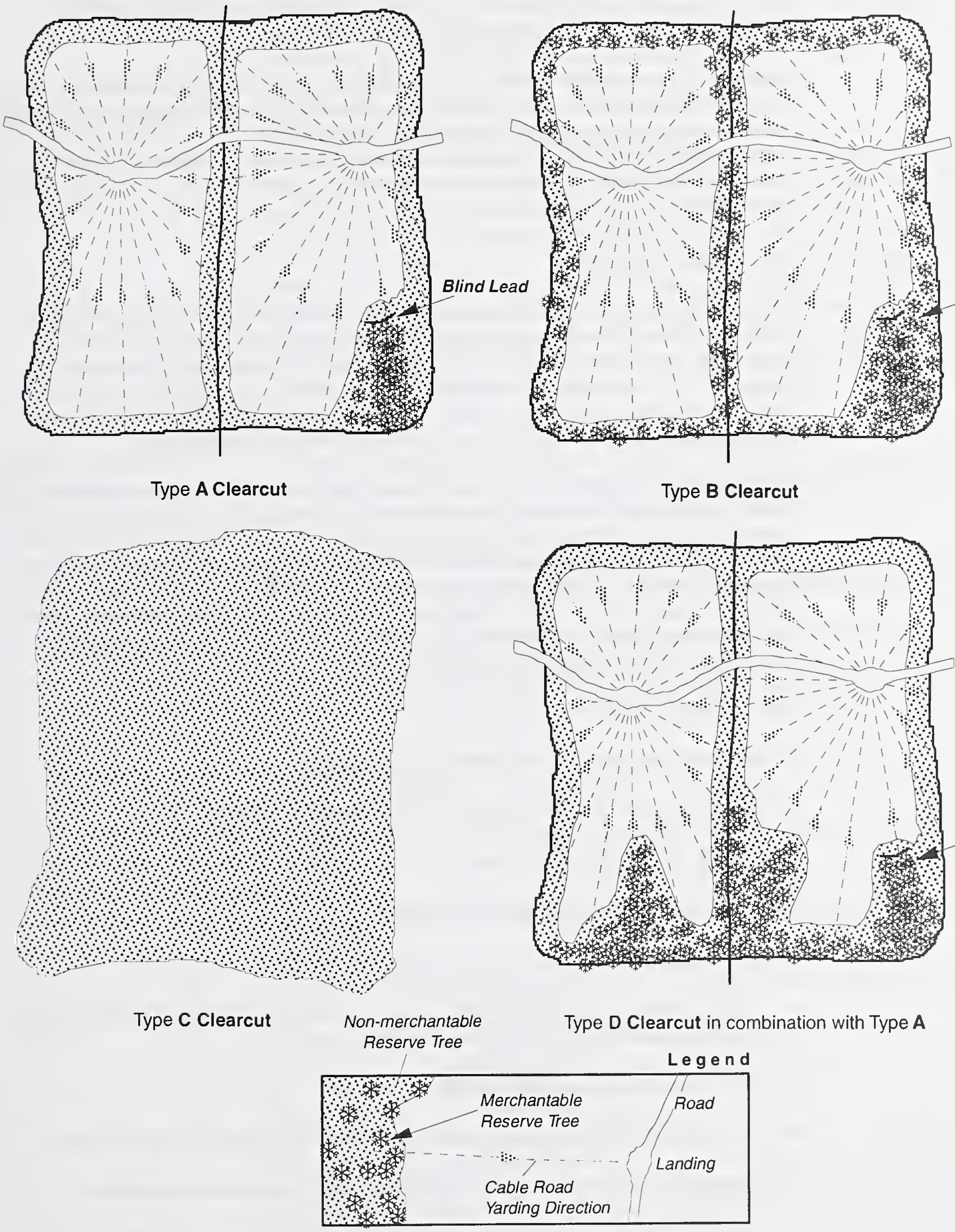
- Unmerchantable trees are often cut and go unutilized.

- Species control is minimal.

A variety of options can be employed to enhance wildlife values and visual quality associated with clearcutting. Reserve trees, including snags, can be retained in clumps or as individual trees throughout the unit, only along setting edges, or in blind leads or other areas that are difficult to log (Forest Service 1993b). These reserve trees provide for greater structural diversity and higher snag densities in the regenerated stand and lessen visual contrast between the clearcut and adjacent old growth.

Clearcuts, incorporating reserve trees, can be categorized into four types. Type A clearcuts would leave safe snags and nonmerchantable reserve trees within a 50 to 100-foot border along harvest unit edges and internal setting boundaries. In this case, trees are directionally felled toward the landing and carefully yarded out of the buffer. Type B clearcuts are similar, except a specified number of snags and live tree replacements with minimum diameter limits are retained in the 50- to 100-foot border. Types A and B clearcuts are practical for implementation with cable yarding. Type C clearcuts would leave nonmerchantable trees and safe snags over the entire unit. This type of clearcut could be used with helicopter yarding. Type D clearcuts would provide clumps of reserve trees in islands or fingers within the unit. This type could be implemented where rock outcrops, cliffs, or blind leads make harvesting uneconomical or infeasible. In addition, clumps of reserve trees could be left in other areas if helicopter yarding or cable yarding with lateral yarding capability is the logging system to be employed. A Type D clearcut could be prescribed by itself or in combination with one of the other three types. Figure 3-13 provides a schematic diagram of these types of clearcutting.

Figure 3-5
Schematic Diagram of Clearcut Types with Reserve Trees



Other even-aged silvicultural systems include seed tree cutting and shelterwood cutting. These systems are beneficial in areas where natural regeneration would not otherwise be adequate or the manager desires to control the seed source for other reasons. Because of the high incidence of windthrown timber in Southeast Alaska, these systems have not been prescribed for use in the Polk Inlet Project.

Clearcutting is recommended as the most suitable silvicultural system for the hemlock-spruce forests of Southeast Alaska. Many factors were analyzed before recommending clearcutting as the most appropriate silvicultural system for the Polk Inlet Project Area. Among those factors were ecological limitations, economic considerations, the difficulty of terrain with its limitations on logging systems, the presence or absence of dwarf mistletoe, and susceptibility of the stand to windthrow or logging damage.

Uneven-aged Systems

Uneven-aged silvicultural systems produce stands of much greater structural diversity than even-aged systems. The diversity is due to the numerous age classes, clumpiness of tree distribution, and generally the presence of a greater number of species within the stand. Regulation of an uneven-aged forest is based on maintaining a range of tree diameters (and ages) with the largest number of trees per acre in the youngest and smallest diameter classes. As trees increase in size and mature, their number are reduced through harvest.

Uneven-aged management would be used in certain areas to meet specific visual resource needs, provide habitat for wildlife, and afford additional protection to sensitive resources. The uneven-aged system will take the form of individual tree selection, diameter cuts, and group-selection cuttings. Diameter cuts have been included in the uneven-aged system because all larger trees down to a specified diameter unique for each species would be harvested. This method of cutting will, over time, created stands with trees of varying ages and sizes. uneven-aged management opens up opportunities to harvest timber where even-aged management would result in unacceptable impacts to other resources.

Some advantages of uneven-aged systems are:

- Provides for easy reproduction of shade tolerant species.
- Creates a minimal increase in exposure of the seedbed to sunlight or wind.
- Is usually more aesthetically pleasing.

Some disadvantages of uneven-aged systems are:

- Sale layout and administration require highly skilled people.
- Logging costs are usually much higher because of lower per-acre volumes harvested and greater care required in the logging process.
- Risk of wind damage increases with partial cutting.
- Generally requires a more extensive road system to secure the same volume of timber.
- Shade tolerant western hemlock would eventually replace spruce and cedar species.

Ecosystem Management

Under ecosystem management, new silvicultural strategies are examined, and older strategies re-evaluated, to bring about a different balance in resource production in managed forests. The basic philosophy of this concept is to mimic natural ecological processes, and to maintain options for future management while more knowledge becomes available about the impacts of forest management activities on the ecosystem.

Ecosystem management looks at the forest on two levels: (1) the landscape level, which may be a VCU, watershed, or viewshed; and (2) the stand level, which addresses individual harvest units. Some concepts to be considered at the landscape level may include maintaining large tracts of undisturbed old growth by concentrating timber harvest in certain areas; minimizing the "edge effect"; and using beach fringe and stream buffers for corridors between old-growth blocks. At the stand level, a variety of tools can be used within both even-aged and uneven-aged silvicultural systems. These include looking for opportunities to retain small patches of uncut timber in harvest units and leaving snags in harvest units (where safety regulations allow). Under even-aged management, the four types of clearcutting (with reserve trees as) described above, can be used. Most uneven-aged silvicultural systems fit the concept of ecosystem management well.

Timber Harvest Methods

Timber harvesting is the process by which standing timber is converted into logs and transported to a manufacturing facility where the logs are converted to a higher value product. The harvesting process can be divided into several steps as follows:

- Road Construction—The construction of logging roads needed to harvest the timber. Includes construction of specified roads, and construction of temporary roads and landings.
- Fall and Buck—The process of falling the timber and cutting the felled timber into logs.
- Yard—The process of moving logs from the stump to a landing or other point of transportation.
- Sort and Load—The process of sorting the logs by grade (either at a landing or a dry sort area) and placing logs on logging trucks.
- Log Haul—The process of transporting the logs from the landing to a log transfer facility (LTF).
- Dump and Raft—The process of decking, bundling, dumping, and rafting logs into the water at an LTF.
- Log Tow—The process of towing the logs from the LTF to the manufacturing facility.

Cutting standing trees (felling) can be accomplished with surprising accuracy by a skilled worker (faller). The experienced faller typically uses equipment such as wedges and hydraulic jacks to control the direction of fall and minimize loss caused by breakage and to avoid other resources such as streams, wet areas, and reserve trees. There are no viable options to discuss for the loading and hauling processes. They are part of the overall harvesting operation and will be performed in much the same manner on all units. However, the yarding process offers a variety of opportunities to reduce environmental effects through careful design and selection of proper yarding method for the site. Yarding is accomplished using ground-based equipment, cable logging systems, or helicopters. The method used depends upon such factors as topography, resource protection needs, and access. The methods can be broadly categorized into ground-based, cable, or helicopter yarding systems.

Ground-based Yarding Systems

Ground-based systems include tractor and shovel yarding. Tractor yarding, referred to as skidding, includes the full range of surface skidding equipment. Ground-based systems are generally confined to downhill logging on gentle slopes.

Shovel yarding is the process of moving logs from the stump to the landing by repeated swinging with a hydraulic loader. The loader is walked off the haul road and into the harvest unit. Logs are decked progressively closer to the haul road with each pass of the loader until they are finally decked at roadside. For this system to be used effectively, soils should be well drained and side slopes should be less than 20 percent.

Cable Yarding Systems

Cable yarding systems proposed for the Polk Inlet Project Area include highlead (Figure 3-6), slackline (Figure 3-7), and live and running skyline (Figures 3-8 and 3-9) systems. Highlead and slackline systems can be used to yard logs both uphill and downhill. Skyline systems are used for uphill logging only. Logs yarded by highlead systems are generally dragged on the ground. Some lift to one end of the log is provided by the height of the towers (90-foot towers are commonly used). Where downhill highlead yarding is used, the drag corridors radiate down and toward the landing. There is greater ground disturbance using downhill highlead yarding and water tends to congregate as dredge corridors converge at the landings. Slackline and skyline systems are able to lift one end of the logs or completely suspend the logs, depending on the unit design. The impact of yarding on the soil is much reduced using these systems when compared with highlead yarding.

Helicopter Yarding Systems

Helicopter yarding is a system by which logs are moved from the stump to the landing with a helicopter. Total suspension of the logs is achieved resulting in the least impact to the soil. Helicopter yarding is also more expensive than yarding with cable or ground-based systems.

Reforestation and Thinning

Regeneration

Natural regeneration is currently used to restock most units harvested in the Polk Inlet Project Area. Hand planting of Alaska yellowcedar is practiced where the Alaska yellowcedar component is desired and would have a low likelihood of regenerating. Hand planting also serves as the backup method for units that cannot be regenerated within 5 years after harvest. Observations regarding regeneration of the relevant species are summarized below.

Western Hemlock—Western hemlock is a prolific seeder and germination will take place on nearly any seedbed that is sufficiently moist, including decaying wood. The adjacent uncut timber stand should provide adequate seed to restock the harvest units within five years after harvest. Western hemlock is also very tolerant and understory advance regeneration will also become part of the restocking component following harvesting.

Figure 3-6
Highlead Yarding System

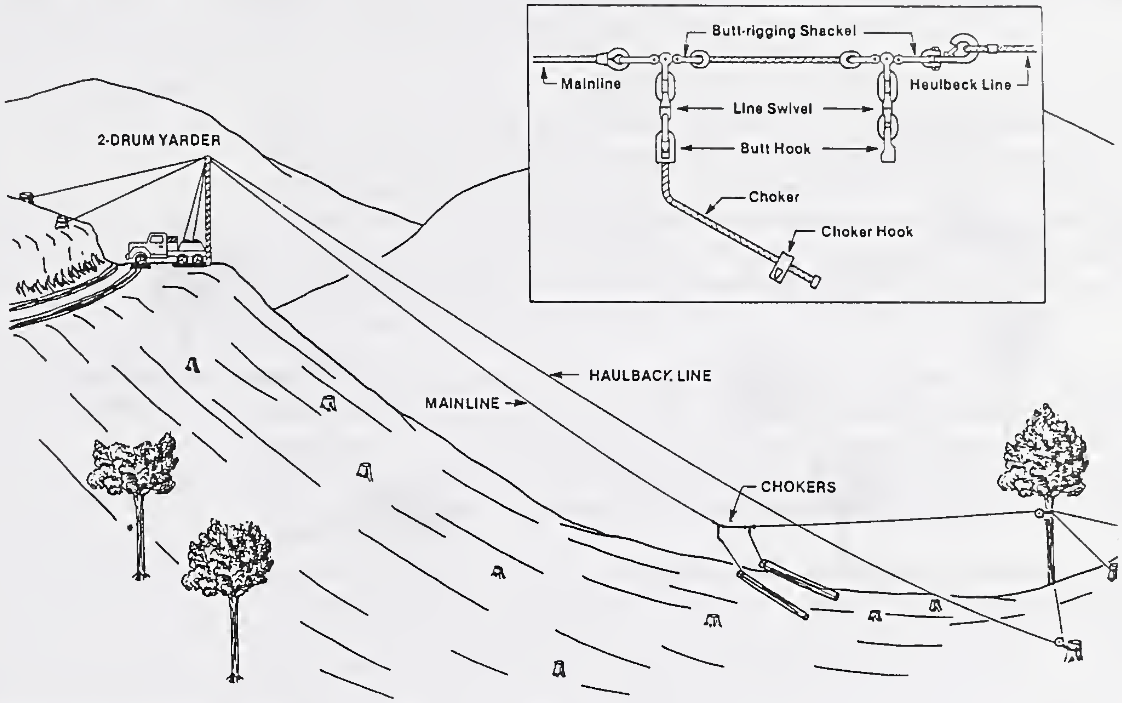


Figure 3-7
Slackline Yarding System

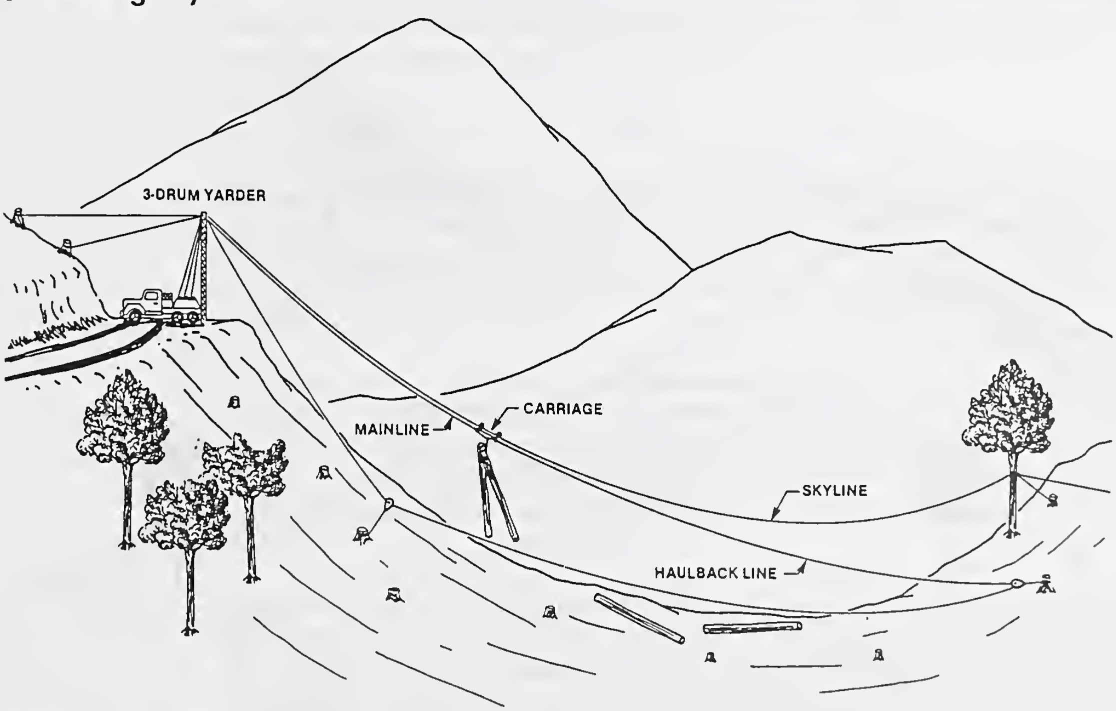


Figure 3-8
Live Skyline Yarding System

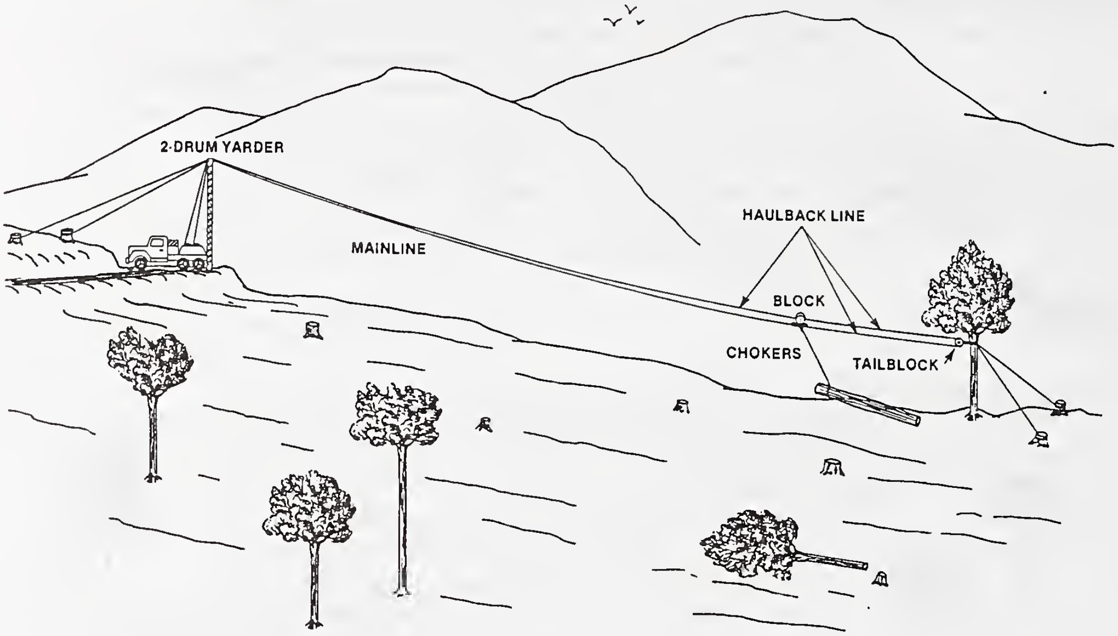
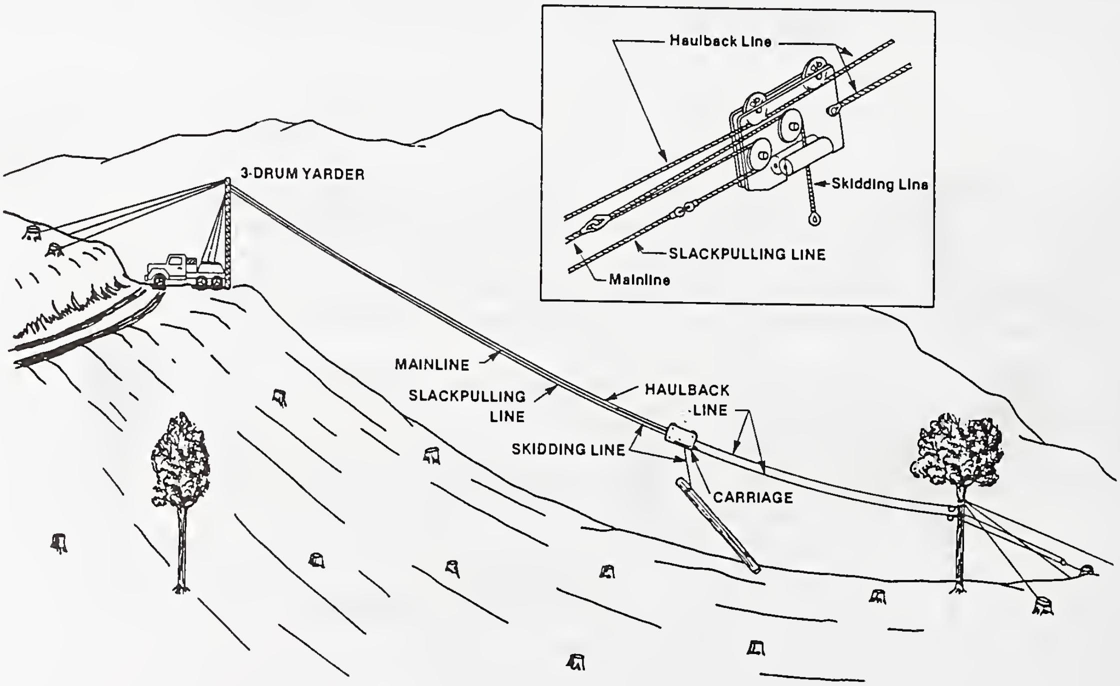


Figure 3-9
Running Skyline Yarding System



Sitka Spruce—Sitka spruce, although not as prolific a seeder as western hemlock, will produce adequate seed at frequent intervals. It prefers a seedbed of mineral soil and generally will outcompete hemlock on lightly disturbed sites. Intense brush competition from salmonberry and other shrub species will usually occur on heavily disturbed sites within the Sitka spruce plant series. Hand planting of Sitka spruce is often done under these conditions.

Sitka spruce has been planted within the Project Area during three different periods: (1) in 1983 in a cutover area along the Hydaburg Road, (2) in 1990 and 1992 after areas logged in 1987 along the road between Twelvemile Arm and Polk Inlet were burned in the fall 1989 for site preparation and then planted, and (3) in 1990 when planting, which totaled 88 acres, was of pure Sitka spruce. An additional 10 acres of a mixture of Sitka spruce and Alaska yellowcedar were planted in 1990 as well. In 1992, 16 additional acres that were burned in 1989 were also planted with Sitka spruce. The plantings have been highly successful, with a survival rate near 90 percent.

Western Redcedar—Western redcedar is a prodigious seed producer, but due to the small surface area of the seed wing, the seed does not travel far from the source. The percent of seeds that germinate is usually quite high but so is the seedling mortality rate, particularly when seedlings are exposed to full light. The best growth is achieved on sites where western redcedar forms a minor component of the stand with hemlock and spruce dominating.

Mountain Hemlock—Mountain hemlock produces regular crops of seed annually after about 25 to 30 years of age. Seeds germinate well on either moist duff or bare mineral soil under favorable conditions. Seedlings are very tolerant, similar to western hemlock. Dense shade causes suppression, but the trees recover rapidly when released.

Yellowcedar—Yellowcedar is present in nearly all of the potential harvest units to some degree. It is not as successful at regenerating naturally as western hemlock and is less tolerant. Yellowcedar competes best on sites too moist for hemlock. It is often hand planted in Southeast Alaska on harvest units that currently have a relatively high percentage of yellowcedar to maintain species composition. Approximately 10 acres of a Sitka spruce and yellowcedar mix were planted within the Project Area in 1990.

Thinning

Thinning is the selective removal of trees in even-aged stands. It is designed to improve future growth by reducing stand density, thus also reducing the competition for sunlight, moisture, and nutrients within the growing space. Thinning is classified as either commercial, in which some or all of the wood harvested is put to use, or precommercial when there is no wood utilization.

Thinning of overstocked stands is a treatment used to increase the growth rate of the remaining trees and the overall timber yield for the stand. Preliminary results of thinning experiments suggest that response of understory vegetation to thinning following canopy closure at 25 to 35 years is much slower than in forests thinned prior to canopy closure. Repeated thinnings throughout the life of the stand may be necessary to maintain a highly productive understory (Alaback 1984).

Precommercial Thinning—A timber stand improvement (TSI) survey is usually conducted at about age 10 years. Precommercial thinning (PCT) is usually performed between the ages of 10 and 20. The PCT spacing for timber production varies by site index with the widest spacing on the highest sitelands. Within the Polk Inlet Project Area, 3,888 acres have been

precommercially thinned. These acres are distributed as follows: 199 acres in VCU 620, 1,611 acres in VCU 621, 810 acres in VCU 622, and 1,268 acres in VCU 624.

Commercial Thinning—Some commercial thinning has been done on the Tongass National Forest in the past, although not on a widespread basis. It is expensive to perform commercial thinning with cable yarding systems. Currently the economics of commercial thinning in Southeast Alaska are marginal due to the limited demand for small diameter logs and logging expense.

Past Harvest and Silvicultural Treatment Activity

There has been much harvest activity within the Polk Inlet Project Area over the past several decades. The majority of past harvesting has been under the KPC Long-term Timber Sale Contract with cutting limited to mature or overmature stands. Commercially harvested species have included western and mountain hemlock, Sitka spruce, western redcedar, and Alaska yellowcedar. Table 3-18 summarizes the acres harvested to date by VCU within the Polk Inlet Project Area, including the Maybeso Experimental Forest and the Old Tom Creek Research Natural Area.

Table 3-18

Area Harvested in the Polk Inlet Project Area (nonencumbered lands only) by Year and VCU (in acres)

						1989-94 EIS		Total	Total
	1950-1959	1960-1969	1970-1979	1981-1982	1987-1988	1989-ROD[1/]	ROD[1/]-1995	to ROD[1/]	thru 1995
610	660	2,171	0	0	0	0	0	2,831	2,831
611	126	151	56	0	0	0	0	333	333
612	0	0	0	0	0	0	15	0	15
613	0	20	0	0	0	543	312	563	875
618	155	60	0	0	0	0	719	215	934
619	0	87	0	0	0	1,053	0	1,140	1,140
620	879	282	0	0	902	1,419	0	3,482	3,482
621	446	3,349	732	0	307	68	500	4,902	5,402
622	146	1,889	0	0	85	0	490	2,120	2,610
624	0	1,470	625	111	781	0	551	2,987	3,538
674	0	113	0	0	0	0	0	113	113
675	0	0	0	0	0	0	0	0	0
Total	2,412	9,592	1,413	111	2,075	3,083	2,587	18,686	21,273

SOURCE: Forest Service, Ketchikan Area, database.

1/ ROD = Polk Inlet ROD, early 1995.

Timber Size, Type, and Volume Classes

Forested lands in the Tongass National Forest are classified by timber type to evaluate the dominant species, timber size class, and volume class. The timber types have been mapped and digitized into the database. Table 3-19 describes the four different stand size class designations. Table 3-20 shows acres by timber size class and VCU or all CFL in the Polk Inlet Project Area.

Table 3-19

Size Class Designations

Symbol	Stand Size Class	Typical Size	Typical Age
1	Seedling & Sapling	0" to 4.9" dbh	0-25 years
2	Pole Timber	5" to 8.9" dbh	25-45 years
3	Young-growth Sawtimber	>9" dbh	45-150 years
4	Old-growth Sawtimber	>9" dbh	>150 years

SOURCE: Forest Service, Ketchikan Area, database.

Note: > = greater than

Table 3-20

Acres by Timber Size Class and VCU for all CFL (including Maybeso Experimental Forest and Old Tom Creek Research Natural Area and excluding encumbered lands)

	Size Class				Total	Non-	Non-	Total
VCU	1	2	3	4	CFL	CFL	Forest	Area
610	2,562	284	34	3,853	6,733	2,858	1,317	10,908
611	343	0	9	2,519	2,871	2,633	336	5,840
612	19	0	0	1,718	1,737	3,472	199	5,408
613	884	548	291	5,784	7,507	9,439	1,419	18,365
618	866	120	71	8,820	9,877	5,074	2,071	17,022
619	1,136	0	23	4,395	5,554	2,505	419	8,478
620	3,814	28	21	10,089	13,952	6,888	2,484	23,324
621	5,504	22	47	7,658	13,231	9,752	240	23,223
622	2,569	0	16	6,131	8,716	6,204	2,394	17,314
624	3,010	0	0	4,636	7,646	6,231	362	14,239
674	116	12	0	9,280	9,408	5,726	2,809	17,943
675	0	2	0	2,826	2,828	3,419	623	6,870
Total	20,823	1,732	512	67,709	90,060	64,201	14,673	168,934

SOURCE: Forest Service, Ketchikan Area database.

Note: Maybeso Experimental Forest = 6,657 acres of CFL primarily in VCU 610. Old Tom Creek Research Natural Area = 3,185 acres of CFL primarily in VCU 618

Table 3-21 describes the seven different volume classes used in the timber type classification. Table 3-22 shows the acres by volume class for all CFL in the Polk Inlet Project Area, including the Maybeso Experimental Forest and the Old Tom Creek Research Natural Area.

Table 3-21
Volume Class Descriptions

Volume Class	Description
3	Second growth stands, 0 - 8 MBF/acre
4	Merchantable stands, 8 - 20 MBF/acre
5	Merchantable stands, 20 - 30 MBF/acre
6	Merchantable stands, 30 - 50 MBF/acre
7	Merchantable stands, greater than 50 MBF/acre

SOURCE: Forest Service, Ketchikan Area, database.

Table 3-22
Acres by Volume Class and VCU for all CFL (including Maybeso Experimental Forest and Old Tom Creek Research Natural Area and excluding Encumbered Lands)

	Volume Class								
VCU	3	4	5	6	7	Total CFL	Non-CFL	Non-Forest	Total Area
610	2,846	1,396	2,060	431	0	6,733	2,858	1,317	10,908
611	343	1,050	1,129	349	0	2,871	2,633	336	5,840
612	19	979	553	174	12	1,737	3,472	199	5,408
613	1,454	3,386	1,212	1,073	382	7,507	9,439	1,419	18,365
618	1,051	3,897	1,849	1,398	1,682	9,877	5,074	2,071	17,022
619	1,136	1,961	756	471	1,230	5,554	2,505	419	8,478
620	3,857	4,492	2,347	2,004	1,252	13,952	6,888	2,484	23,324
621	5,560	3,704	2,713	1,062	192	13,231	9,752	240	23,223
622	2,569	2,371	3,047	721	8	8,716	6,204	2,394	17,314
624	3,010	2,128	2,250	255	3	7,646	6,231	362	14,239
674	128	2,985	2,381	1,772	2,142	9,408	5,726	2,809	17,943
675	2	984	936	332	574	2,828	3,419	623	6,870
Total	21,975	29,333	21,233	10,042	7,477	90,060	64,201	14,673	168,934
% of Total CFL	24	33	24	11	8	100			

SOURCE: Forest Service, Ketchikan Area, database.

Approximately 75 percent of the CFL in the Project Area is occupied by old-growth forests. These are ecosystems distinguished by old trees and complex structural attributes. Old-growth forests encompass the latter stages of stand development and typically differ from earlier stages of stand development in a variety of characteristics that may include tree size, accumulation of large dead woody material, number of canopy layers, tree species composition, and ecosystem function (TLMP Draft Revision 1991a). Much of the timber is declining in vigor and quality because of insects, disease, and mechanical damage. These over-mature stands are assumed to have reached an equilibrium in productivity where annual growth is offset by mortality so that net growth is near, or even below, zero. In spite of containing a considerable amount of defective wood, old-growth forests are a good source of timber for lumber and pulp production.

Timber Volume

Polk Inlet Project Area timber was cruised concurrently with the stand examination process. Table 3-23 shows the average cruised volumes per acre by species and by VCU for potential harvest units in the Polk Inlet Project Area.

Table 3-23

Weighted Average Volume Per Acre by Species Group and VCU in Potential Harvest Units

	Species				
	Hemlock	Spruce	Cedar	Other	
	Volume (BF)/Acre				Totals
610[1/]	—	—	—	—	—
611	8,194	2,425	10,819	1,193	22,631
612	5,862	1,828	39,973	1,551	49,214
613	13,260	5,379	21,768	0	40,406
618	16,444	7,187	21,620	0	45,251
619	10,083	4,212	25,087	0	39,382
620	20,523	6,573	17,135	2,676	46,907
621	8,674	3,741	15,057	519	27,991
622	14,872	2,500	15,943	2,541	35,856
624	4,597	4,110	16,006	752	25,465
674	26,436	6,707	3,232	8,993	45,368
675	11,088	6,167	7,632	1,653	26,540

SOURCE: Mehrwein et al. 1993. Based on sampled stands.

1/ No stands sampled in VCU 610.

Forest Land Classification

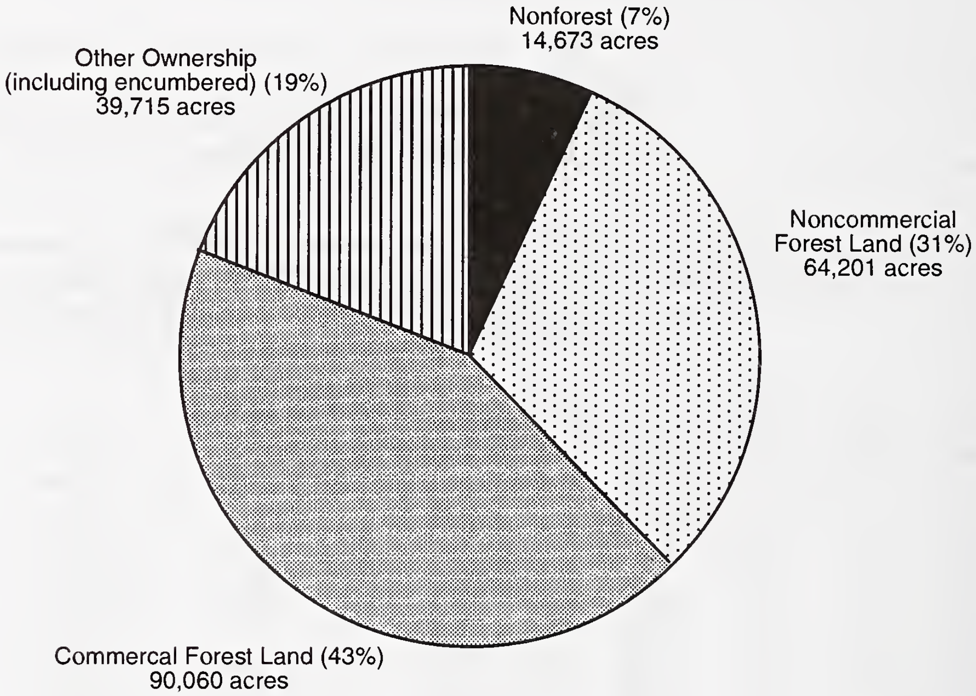
The 208,649 acres of land within the Polk Inlet Project Area are defined by their ownership and vegetative cover. This land has been categorized as forest land, nonforest land, or other ownership. Figure 3-10 displays the breakdown of the various land classifications in the Project Area.

Other Ownership

Other ownership refers to lands owned by private individuals, by the State of Alaska, or by Alaska Native corporations. These land ownership categories include 19,848 acres.

For the purposes of this document, other ownership also includes lands which have been selected but not conveyed to the State or to Native corporations (see *Lands* section of this chapter).

Figure 3-10
Forest Land Classification



SOURCE: Forest Service, Ketchikan Area, database.

Approximately 19,867 acres of the Project Area are encumbered or may soon be in other ownership. Combined, these two land groupings include 39,715 acres or about 19 percent of the Project Area.

Nonforest Land

Nonforest land is defined as National Forest System land that is biologically unable to support at least a 10 percent cover of forest trees. These lands include muskegs, rock outcroppings, talus slopes, alpine vegetation, and freshwater bodies among others. About 7 percent or 14,673 acres of the Project Area is classified as nonforest land.

Forest Land

Forest land refers to National Forest System land that is at least 10 percent covered by forest trees of any size or formerly had such tree cover and is not currently developed for nonforest use. About 74 percent or 154,261 acres of the Project Area are considered forest land. These lands are further categorized as Commercial Forest Land (CFL) or non-CFL.

CFL is capable of producing continuous crops of timber. The Forest Service has defined CFL as land that is capable of producing at least 20 cubic feet of annual tree growth per acre or contains at least 8 MBF of net timber volume per acre (Forest Service 1977a). Old-growth or second-growth stands (younger, even-aged stands that grew after the previous stand was harvested or destroyed by agents such as wind, fire, or insects) may qualify as CFL. The Polk Inlet Project Area contains 90,060 acres of CFL, representing about 43 percent of the total land base.

Noncommercial forest land is forest land that does not support enough timber volume nor is capable of producing timber volume fast enough to meet the criteria for CFL. About 64,201 acres or 31 percent of the Project Area is noncommercial forest land.

Tentatively Suitable and Available Forest Land

CFL is further classified as tentatively suitable or not tentatively suitable for timber harvest. Suitability classification is undergoing review as identified in Appendix A of the TLMP Draft Revision (1991a). To be considered tentatively suitable, CFL must:

- Be capable of harvest with available technology to ensure timber production without irreversible resource damage to soil productivity or watershed conditions (this eliminates lands with a very high mass movement potential);

- Be capable of being restocked within 5 years after final harvest (this eliminates lands considered not restockable based on their soil series or plant association); and

- Have not been withdrawn from timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service (this eliminates Wilderness Areas, Research Natural Areas, Experimental Forests, and TTRA stream buffers).

To be considered suitable and available for harvest, tentatively suitable CFL must have a LUD that allows commercial timber harvest (LUD III or LUD IV).

In addition, For the purposes of this analysis, tentatively suitable CFL which has a management prescription, based on the preferred alternative (Alternative P) of the TLMP Draft Revision (1991a), that precludes timber harvest is considered not available. In the Project Area, these lands include areas within beach fringe and estuarine buffers, eagle nest buffers, and no-harvest riparian areas beyond the TTRA minimum stream buffers. Table 3-24 presents a summary of the tentatively suitable and available CFL in the Project Area and the acreages excluded from this classification for the reasons identified. Because many of the withdrawn acres could be excluded for more than one reason, the table is presented in a sequential manner so that the acreages are additive. That is, each category presents the additional acres withdrawn after the preceding acres are removed.

The Project Area contains approximately 67,031 acres of tentatively suitable and available CFL. About 24 percent or 16,059 acres of these lands consist of second-growth forest that is currently too young for harvesting. Therefore, the potential unit pool area for the Polk Inlet Project includes 50,972 acres. These acreages are itemized by VCU in Table 3-25.

Table 3-24

Adjustments to the CFL Leading to Tentatively Suitable and Available CFL

CFL Category	Area in Acres
Total CFL	90,060
CFL withdrawn due to [1/]	
Research Natural Area	3,185
Experimental Forest	6,657
Estuarine Buffers	1,459
Beach Fringe Buffers	3,879
Eagle Nest Buffers	13
Riparian Buffers (including TTRA)	4,243
Soils with Very High Mass Movement Potential	559
Soils with Restocking Problems	3,034
Total CFL Withdrawn	23,029
Tentatively Suitable and Available CFL	67,031
Deferred as Second Growth	16,059
Tentatively Suitable and Available CFL for Polk Inlet Project	50,972

SOURCE: Mehrwein et al. 1993.

1/ Withdrawn acres are presented sequentially so that acreages are additive. Each category presents the additional acres withdrawn after the categories above it have been removed.

Table 3-25

Tentatively Suitable and Available CFL for the Polk Inlet Project by VCU

	Total Project Area Tent. Suitable & Available CFL	Acres Deferred as Second Growth	Tent. Suitable and Available CFL for Project
610	100	23	77
611	2,328	244	2,084
612	1,509	12	1,497
613	6,139	1,454	4,685
618	5,298	739	4,559
619	4,538	1,058	3,480
620	11,351	2,965	8,386
621	11,127	4,485	6,642
622	8,016	2,110	5,906
624	6,568	2,945	3,623
674	7,719	24	7,695
675	2,338	0	2,338
Total	67,031	16,059	50,972

SOURCE: Mehrwein et al. 1993.

Logging System and Transportation Analysis

During the spring and summer of 1992, a Logging System and Transportation Analysis (LSTA) was conducted for the Polk Inlet Project. The LSTA identified site-specific harvest units and supporting road networks in all of the tentatively suitable and available CFL for the Polk Inlet Project. Some areas mapped in the Ketchikan Area GIS as unsuitable due to soils were also included in the LSTA pending ground-verification. The end product of the LSTA was a total unit pool for the Project Area from which a Project unit pool was selected. The Project unit pool was identified following an interdisciplinary review of the total unit pool and represented one possible configuration of potential harvest units that could be taken under Forest Plan standards and guidelines during this entry. The Project unit pool initially included 192 units, but was reduced to 160 units following ground verification. The factors that resulted in elimination of units from the Project unit pool were adjacency with recently harvested areas, cumulative visual disturbance, and cumulative watershed disturbance, among others. The Project unit pool and associated roads were ground-verified during summer 1992 and represented the pool of units and roads from which all action alternatives were selected.

Operability

The tentatively suitable and available CFL for the Polk Inlet Project was further refined into operability classes. Operability refers to timber harvest operability and is defined based on the logging system necessary to yard the trees from stump to landing. There are three different classes of operability; normal, which includes highlead, tractor, shovel, running skyline, live skyline, standing skyline, and slackline; difficult, which includes multi-span skyline and helicopter; and isolated, which only includes helicopter. Figure 3-11 displays the area in each operability class in the Polk Inlet Project Area as defined by the LSTA.

Proportionality of Volume Classes 6 and 7

TTRA modified the KPC Long-term Timber Sale Contract as follows:

> . . .eliminate the practice of harvesting a disproportionate amount of old-growth timber by limiting the volume harvested over the rotation in volume classes 6 and 7 as defined in TLMP and supporting documents, so that the proportion of volume harvested in these classes within a contiguous management area does not exceed the proportion of volume currently represented by these classes within the management area.

This is referred to as the "Proportionality Analysis." In the Polk Inlet Project Area, there are two Management Areas (MA's) represented. Management Area K17 consists of VCU's 610, 611, 621, 622, and 624. MA K18 consists of VCU's 612, 613, 618, 619, 620, 674, and 675.

Forest Service Sale Preparation Handbook for Region 10 (Supplement No. 2409.18-92-5) contains the procedure for calculating and measuring compliance with the proportionality requirements of the TTRA. The baseline for measuring proportionality is the date the TTRA was signed into law (November 28, 1990). Volume class determination is based on net sawlog inventory volume class strata as determined from the MA's timber type (TIMTYP) map, per Forest Service Handbook (FSH) direction.

Figure 3-11
Operability Classes of the Tentatively Suitable and Available CFL in Polk Inlet Project Area

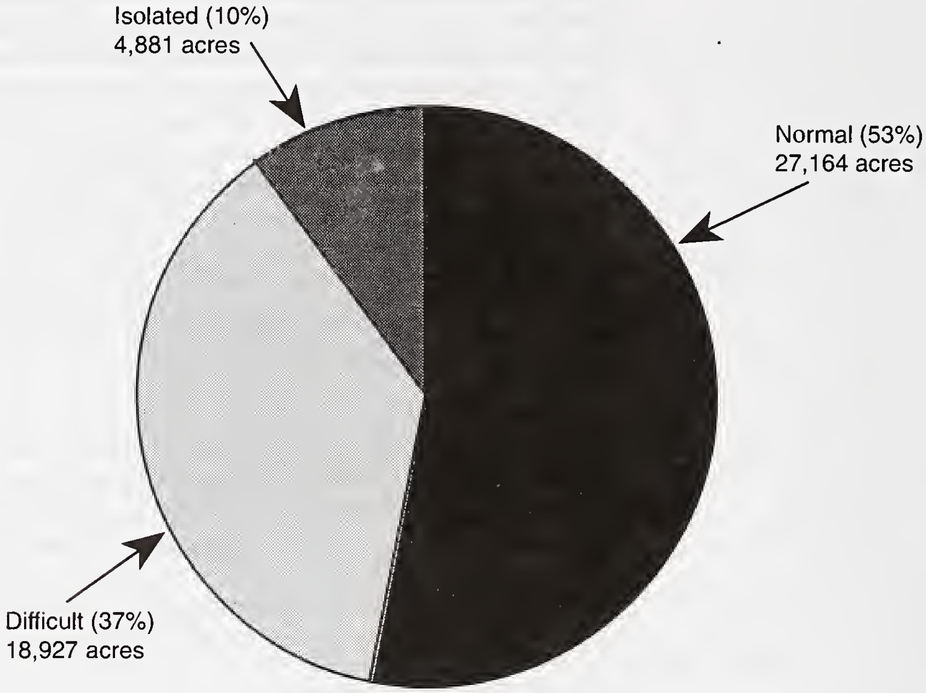


Table 3-26 displays the existing proportion of Volume Classes 6 and 7 by MA, for 1993 and 1994. The proportionality percentages can be compared with the baseline percentages. The "difference" column identifies whether the proportion of Volume Classes 6 and 7 has increased (positive difference) or decreased (negative difference). The data in Table 3-26 indicate that after completion of the harvest associated with the 1989-94 EIS (Forest Service 1989), both MA's will have proportionalities from 0.61 to 0.81 percent less than the TTRA baseline.

Table 3-26
Existing Proportion of Volume Classes 6 and 7 by Management Area[1/]

	Total Timber Base (acres)	Volume Class 6 & 7 (acres)	Proportionality[1/] (percent)	Difference[2/] (percent)
Management Area K17				
TTRA Baseline				
(on November 28, 1990)	29,518	3,584	12.14	
Existing—1993				
-Harvested Prior to ROD[3/]	-76	0		
-Remaining in K17	29,442	3,584	12.17	+0.03
Existing—1994				
-Scheduled for Harvest After ROD	-1,390	-351		
-Remaining in K17	28,052	3,233	11.53	-0.61
Management Area K18				
TTRA Baseline				
(on November 28, 1990)	50,751	19,489	38.40	
Existing—1993				
-Harvested Prior to ROD	-3,151	-1,680		
-Remaining in K18	47,600	17,809	37.41	-0.99
Existing—1994				
-Scheduled for Harvest After ROD	-907	-258		
-Remaining in K18	46,693	17,551	37.59	-0.81

1/ Includes lands encumbered after TTRA so that comparisons can be made with TTRA baseline.

2/ Proportionality = Acres of Volume Classes 6 and 7 divided by the Total Timber Base.

3/ A positive difference indicates that the percent of Volume Classes 6 and 7 remaining in the MA is higher than the TTRA baseline. A negative difference indicates a lower percentage than the TTRA baseline.

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Wildlife

Key Terms

Carrying capacity—the maximum number of a wildlife species that can be supported in a given area or habitat through the most critical period of the year.
Ecological province—biogeographic areas characterized by similar patterns of species composition, similar distributional patterns of organisms, and a similar geomorphological history.
Habitat—the sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.
Habitat capability—an estimated number of individuals of a species that a habitat can sustain.
Game Management Unit—an Alaska Department of Fish and Game (ADF&G) land division used to regulate the harvest of wildlife species.
Management Indicator Species (MIS)—vertebrate species whose population changes are believed to best serve as an index of a biological community's response to the effects of land management activities or which are important to hunters and trappers.
Viable population—the number of individuals of a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations well distributed throughout their range in the National Forest.
Value Comparison Unit (VCU)—land management units which generally encompass a drainage basin to provide a common set of areas where resource inventories can be conducted and resource interpretations made.
Wildlife Analys Area (WAA)—division of land identified by the ADF&G and used by the Forest Service for wildlife analysis.

Introduction

Alaska's wildlife are valuable for aesthetic, economic, recreational, ecological, and subsistence reasons. Over 350 species of mammals, birds, amphibians, and reptiles occur on the Tongass National Forest, and most of these can be found on the Polk Inlet Project Area. They occupy a diverse range of land types and plant communities, and are variably adapted to climatic extremes, changes in habitat, predation, and hunting pressure.

The Polk Inlet Project Area intersects two ecological provinces: North Central and South Prince of Wales (TLMP Draft Revision 1991a). The two provinces are separated by Cholmondeley Sound, with the majority of the Project Area located in the southern end of the North Central Prince of Wales Island Province, and a small portion located on the northern tip of the South Prince of Wales Island Province. The diversity of habitats within the Project Area support a variety of terrestrial species, and numerous inlets, coves, and bays in the Project Area support an abundance of shellfish and aquatic plants that provide food for a variety of waterfowl, shorebirds, seabirds, and marine mammals. The Project Area is within ADF&G Game Management Unit 2, which typically has the highest annual harvest levels for Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), black bear (*Ursus americanus*), marten (*Martes americana*), and river otter (*Lutra canadensis*) of any of the Game Management Units on the Tongass National Forest (TLMP Draft Revision 1991a).

Wildlife Analysis Areas (WAA's)

Wildlife analyses in this section are presented primarily on two analysis levels: Value Comparison Units (VCU's) and Wildlife Analysis Areas (WAA's). VCU's are those areas that generally correspond to a specific drainage and were established in the Tongass National Forest to provide a common set of areas within which resource inventories could be conducted and impacts evaluated. VCU's also allow a more detailed interpretation of analyses results. WAA's are larger management units delineated by the ADF&G that are used to achieve regional population goals for subsistence species. WAA's generally encompass multiple VCU's and within the Project Area, two of the VCU's exist in two different WAA's. Relative to the Polk Inlet Project Area, the WAA boundaries extend outside the Project Area and include VCU's not considered in this EIS. Table 3-27 shows the WAA's in the Project Area by total National Forest System acreages, VCU's, and VCU acreages and percents. References to WAA's in this section refer only to that portion of the WAA within the Project Area. Figure 3-12 presents the locations of VCU's within the WAA's.

Wildlife Habitat

Habitat provides the essentials that a species must have to survive and reproduce successfully. Wildlife species are known to select habitat in accordance with certain criteria that relate to microclimate, physiography (slope, elevation, aspect), prey densities, protection from predators, and a variety of vegetative features. A species may occupy a range of habitat types and would, thus, be a generalist in its habitat selection, while another may be a specialist on one distinctive kind of habitat or vegetation type in one or more seasons. Generalist species are usually more tolerant of natural or human-induced changes in habitat, while specialists typically respond adversely to rapid changes in habitat. Wildlife habitats in the Project Area are described using data contained in the Forest Service GIS layers. The GIS database was developed from the results of timber stand exams, aerial photo interpretation, and field studies. Data layers were corrected, as needed, based on site visits.

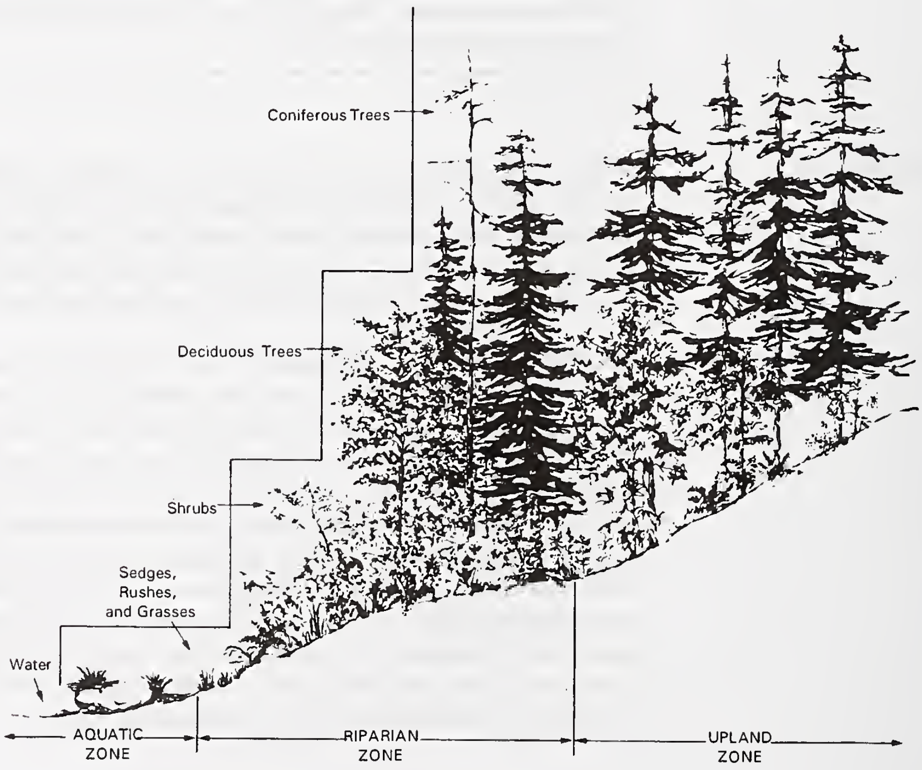


Table 3-27
Wildlife Analysis Areas (WAA's) and Value Comparison Units (VCU's) in the Polk Inlet Project Area

WAA	Total NF System Acres in WAA 1/	VCU's in WAA 2/	Project Area NF System Acreage in WAA 3/	% of WAA in VCU
1107	151,395	621	3,430	2.3
		674	1,031	0.7
Subtotal			4,461	3.0
1213	34,427	674	16,912	49.1
		675	6,870	20.0
Subtotal			23,738	69.1
1214	75,954	620	23,324	30.7
		613	18,365	24.2
		618	17,022	22.4
		619	8,478	11.2
		612	5,408	7.1
Subtotal			72,597	95.6
1317	61,625	621	19,793	32.1
		622	17,314	28.1
		610	10,908	17.7
		611	5,840	9.5
Subtotal			53,855	87.4
1332	68,711	624	14,239	20.7

SOURCE: Forest Service, Ketchikan Area, database.

1/ WAA boundaries extend outside the Project Area.
2/ Some VCU's overlap with more than one WAA.
3/ Does not include encumbered lands.

Wildlife habitats identified in the Project Area include: beach fringe; estuary fringe; inland wetland; riparian; forest muskeg; low, mid, and high elevation forest; alpine/subalpine; and old-growth forest. Tables 3-28a and 3-28b display acres of wildlife habitats within the Project Area. Summaries of individual habitats are presented below.

Figure 3-12
Distribution of Wildlife Analysis Areas (WAA's) and Value Comparison Units (VCU's) in the Polk Inlet Project Area

SOURCE: Forest Service, Ketchikan Area, database.

Table 3-28a

Wildlife Habitat Types in the Polk Inlet Project Area Under 1995 Existing Conditions (in acres)[1/, 2/]

VCU	Beach Fringe	Estuary Fringe	Inland Mesic Habitat	Riparian	Scrub Forest
610	0	21	26	1,640	305
611	374	0	68	623	414
612	3	2	138	701	1,241
613	1	0	363	3,346	2,894
618	791	389	237	2,453	889
619	579	122	85	823	426
620	646	266	104	3,623	1,198
621	866	619	161	2,189	1,515
622	0	0	162	2,255	892
624	0	81	64	1,790	1,266
674	605	228	72	1,972	291
675	156	191	101	1,044	995
Total	4,021	1,919	1,581	22,459	12,326

SOURCE: Forest Service, Ketchikan Area, database.

1/ National Forest System lands only.

2/ Certain habitat areas may overlap. For example, riparian and beach fringe may be included in estuary fringe.

Table 3-28b

Wildlife Habitat Types in the Polk Inlet Project Area Under 1995 Existing Conditions (in acres)[1/, 2/]

VCU	Low Elevation Old Growth	Mid Elevation Old Growth	High Elevation Old Growth	Old Growth (Vol. Class 4-7)	Alpine/ Subalpine
610	827	1,424	1,636	3,887	1,405
611	1,298	770	460	2,528	1,373
612	1,523	184	11	1,718	262
613	2,890	1,948	1,215	6,053	2,087
618	4,410	3,141	1,275	8,826	3,009
619	2,417	1,109	892	4,418	1,392
620	4,251	3,521	2,323	10,095	2,920
621	4,181	2,585	905	7,671	4,341
622	2,145	2,461	1,541	6,147	3,037
624	2,216	1,812	608	4,636	1,614
674	3,972	3,307	2,001	9,280	3,305
675	1,691	933	202	2,826	948
Total	31,821	23,195	13,069	68,085	25,693

SOURCE: Forest Service, Ketchikan Area, database.

1/ Nonencumbered National Forest System lands only.

2/ Acres of habitats may overlap. For example, low, mid, and high elevation old growth are also included in old growth.

Beach Fringe

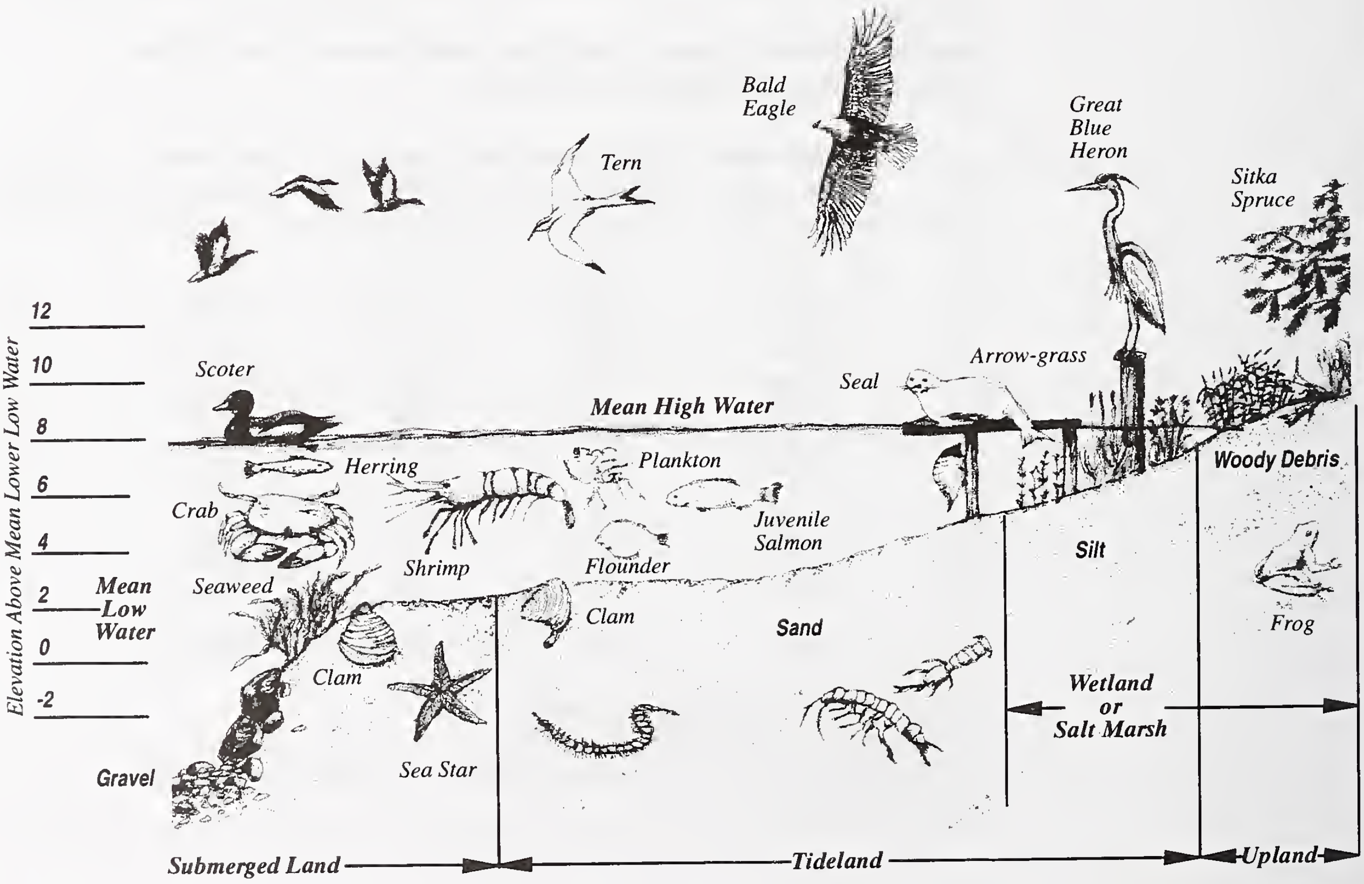
Beach fringe represents the area within 500 feet of the coastal zone that is transitional between land and water, salt and fresh water, and vegetated and nonvegetated conditions. Forested areas in this transition zone typically receive high use by species with high economic, recreational, subsistence, or aesthetic values including black bear, river otter, bald eagle (*Haliaeetus leuocephalus*), marten, black-tailed deer, and Vancouver Canada goose (*Branta candensis fulva*). Many of these species are abundant in mature and old-growth forest stands. Approximately 4,021 acres of beach fringe occurs in the Project Area. This habitat type is most abundant in VCU 621 (Table 3-28a).

Estuary Fringe

Estuary fringe begins with the high-water mark in an estuary (i.e., salt marsh) and extends 1,000 feet into uplands. The estuary fringe differs from beach fringe primarily in the size of the buffer and the type of species that nest or forage within this zone. Black bear, river otter, mink, beaver, bald eagle, and numerous waterfowl and shorebirds tend to concentrate in this zone. Approximately 1,919 acres of estuary fringe occur in the Project Area. This habitat type is most abundant in VCU 621 (Table 3-28a).

Inland Mesic Habitat

Inland mesic habitats are defined as forested and associated grass/sedge meadow areas within 100 feet of low-elevation lakes, beaver ponds, and marshes. Black bear, furbearers, certain waterfowl (e.g., wintering trumpeter swans), and numerous other wildlife species tend to concentrate in inland mesic habitats. Approximately 1,581 acres of inland wetland occur in the Project Area. This habitat type is most abundant in VCU 613 (Table 3-28a).



Riparian

Riparian habitat occurs along streams or around inland lakes and represents a transitional zone between aquatic and terrestrial communities. This habitat type tends to contain both hardwood (e.g., alder and cottonwood) and coniferous forest types and, therefore, supports high species richness. Riparian areas also provide important linkages to other habitat areas and may act as travel corridors for certain wildlife. Riparian habitat is here defined as stated in Section 3.4. Over 22,000 acres of riparian habitat occur in the Project Area. It is most abundant in VCU's 613 and 620 (Table 3-28a).

Scrub Forest

Scrub forests habitats are defined based on the GIS-mapped timber type identified as low productivity forest due to muskeg. Scrub forest is primarily characterized by Alaska yellowcedar (*Chamaecyparis nootkatensis*), shore pine (*Pinus contorta*), skunk cabbage (*Lysichitum americanum*), and associated sedges and bog vegetation communities. The water table is at the surface and numerous small ponds are scattered throughout. Muskegs provide important foraging habitat for bears and winter rest sites for trumpeter swans. Approximately 12,326 acres of scrub forest occur in the Project Area. This habitat type is most abundant in VCU 613 (Table 3-28a).

Low-elevation Forest

Low-elevation forest corresponds to the low-elevation band in the deer habitat capability model (Suring et al. 1988a). This zone was delineated from sea level to the 800-foot contour line and includes all habitat types within the Project Area. Low-elevation old growth, which is included in this band, provides essential winter range for deer, nesting habitat for bald eagles (Suring et al. 1988f), cover for river otter (Suring et al. 1988e), and foraging habitat for black bear (Suring et al. 1988b). These areas are especially important during severe winters when deep snows restrict deer use to low-elevation areas. Species richness also tends to be highest in low-elevation areas compared to high elevations (Harris 1984). Approximately 32,000 acres of low-elevation old-growth forest occur in the Project Area. This habitat type is most abundant in VCU 621 (Table 3-28b).

Mid-elevation Forest

Mid-elevation forest corresponds to the mid-elevation band in the deer habitat capability model (Suring et al. 1988a). This zone is defined as the elevation band from 800 to 1,500 feet that serves as a travel corridor for deer moving to summer ranges in alpine areas (Suring et al. 1988a). Approximately 23,000 acres of mid-elevation old growth occur in the Project Area. This habitat type is most abundant in VCU 621 (Table 3-28b).

High-elevation Forest

High-elevation forest corresponds to the high-elevation band in the deer habitat capability model (Suring et al. 1988a). This zone is defined as the elevation band from 1,500 feet to tree line and serves as important summer range for deer and bear. Vancouver Canada geese have also been sighted using muskegs and ponds in high-elevation areas after the breeding season. Approximately 13,000 acres of high-elevation old growth occur in the Project Area. This habitat type is most abundant in VCU 620 (Table 3-28b).

Alpine/Subalpine

Alpine/subalpine roughly corresponds to the zone near or above tree line (generally about 2,500 feet). It includes forests identified in the GIS database as low productivity forest due to high elevation as well as nonforest types. This zone also provides important summer range for deer and bear, and resting or brooding habitat for geese. Approximately 25,693 acres of alpine/subalpine occur in the Project Area. This habitat type is most abundant in VCU 621 (Table 3-28b).

Old-growth Forest

Old-growth forest has been the subject of much recent national attention because of reductions of up to 90 percent of this forest type in the contiguous United States (Norse 1990). Currently, most (85 to 90 percent) of the pre-logging old-growth forest still exists in the Tongass National Forest (Sidle 1985, TLMP Draft Revision 1991a). Productive (capable of producing 20 cubic feet of usable timber volume per acre per year) and unproductive (less than 20 cubic feet of usable timber volume per acre per year) old growth represents about 30 percent and 21 percent, respectively, of the total acreage on the Tongass National Forest (TLMP Draft Revision 1991a). About 10 percent of the total productive old growth on the Tongass National Forest occurs in the Northern Prince of Wales Island province and about 3 percent occurs in the South Prince of Wales province (TLMP Draft Revision 1991a).

Old-growth forest on the Tongass National Forest is generally characterized by wide variation in tree sizes and spacing, multiple canopy layers, natural canopy gaps formed by the death of overstory trees, understory patchiness, decadence in the form of broken or deformed tree tops or bole and root decay, and snags and downed logs (TLMP Draft Revision 1991a). In Southeast Alaska, these structural attributes are usually not present in a stand younger than 150 years (Alaback 1984). Old-growth forest is incorporated in beach fringe, estuary fringe, riparian, and other habitat types; therefore, the acreage values for this habitat type in Table 3-28b overlap with other habitat categories that also contain old growth. Old growth is assumed here to be forest types characterized by Volume Class 4 and above. The Project Area contains approximately 68,085 acres of old-growth forest (Table 3-28b). Of the 12 VCU's in the Project Area, VCU 620 has the most old growth. Old growth in these areas provides essential habitat for a variety of wildlife species, including Sitka black-tailed deer, marten, black bear, bald eagle, Vancouver Canada goose, and cavity-nesting species (see Sidle 1985 and DellaSala et al. 1992 for additional wildlife species that utilize old growth on Prince of Wales Island).

The Polk Inlet WAA's include a variety of forest conditions ranging from low volume (Class 3) to high volume (Classes 6 and 7) forest, and from Size Class 1 (seedling/sapling) to Size Class 4 (old-growth forest) (Tables 3-22, 3-20). Notably, most of the high volume timber (Volume Classes 6 and 7) remaining in the Project Area occurs in VCU's 618, 620, and 674. Extensive portions of the Project Area are covered by second growth and noncommercial forest types (Tables 3-18, 3-20, and 3-22). Second growth is most prevalent in VCU's 610, 620, 621, and 624, and noncommercial forest is most extensive in VCU's 613 and 621.

Management Indicator Species

The wide variety of habitats and species occurring within the Project Area makes it impractical to assess the impacts of timber management alternatives on each species independently. Therefore, wildlife habitats were evaluated and species were selected to act as indicators of the effects of timber management alternatives. The Project analysis focused primarily on the threatened, endangered, and sensitive (TES) species and the Management Indicator Species (MIS) of the Tongass National Forest that occur in the Project Area.

MANAGEMENT INDICATOR SPECIES (MIS)—Wildlife
Black Bear
Marten
River Otter
Gray Wolf
Sitka Black-tailed Deer
Vancouver Canada Goose
Bald Eagle
Red-breasted Sapsucker
Hairy Woodpecker
Brown Creeper

Based on the likelihood of occurrence in the Project Area, 10 of the 13 MIS of the Tongass National Forest were chosen for this analysis: black bear, marten, river otter, gray wolf (*Canis lupus*), Sitka black-tailed deer, Vancouver Canada goose (*Branta canadensis fulva*), bald eagle (*Haliaeetus leucocephalus*), red-breasted sapsucker (*Sphyrapicus ruber*), hairy woodpecker (*Dendrocopus villosus*), and brown creeper (*Certhia familiaris*). Three other MIS of the Tongass National Forest—brown bear, mountain goat (*Oreamnos americanus*), and red squirrel (*Tamiasciurus hudsonicus*)— were not used in this analysis because they are not found on Prince of Wales Island.

Habitat Capability for the Management Indicator Species

Habitat quality and quantity for each MIS were evaluated in the Project Area using the habitat capability models developed during revision of the TLMP and designed to be run interactively with a GIS (see Appendix B of TLMP Draft Revision 1991a). To estimate habitat capability for MIS, a grid of sampling points was overlaid onto a digital map of the Project Area, each point representing a 20-acre cell. Habitat suitability index (HSI) values were obtained for each of the sample points using a series of computer programs that were developed to extract data from GIS layers. The programs relate habitat information on site-specific conditions (e.g., aspect, elevation, timber type, volume class, etc.) to each sample point within the sampling grid. HSI values for a given point were then derived by relating habitat information for the specific cell to the corresponding HSI value available in a lookup table provided by the computer program. HSI values were then summarized across the project area and converted to habitat capabilities, which are modeled estimates of the capacity of an area to support a number of individuals of a wildlife species. Habitat capability values were then summed by VCU's and WAA's for each MIS. Project Area patch size effectiveness (PSE) values were calculated for the five species for which the relationship between old-growth patch size and habitat capability has been modeled (Workshop to recommend patch size relationships and corridor requirements for the MIS and TES species, Juneau, Alaska, July 31 to August 1, 1989). The Project Area PSE was then used to adjust each WAA habitat capability. Habitat capabilities were calculated for 1954, which represents pre-logging habitat conditions. For the 1954 analysis, all current second growth and 1989-94 clearcuts were assumed to be old-growth forest of Volume Class 6 and Size Class 4.

While the models provide an estimate of habitat quality for a given area, habitat quality may not be a reliable indicator of carrying capacity (Van Horne 1983). In addition, the relationship between habitat capability and existing populations has not been verified, and actual populations may be above or below the estimated habitat capability. Therefore, the habitat capability values are not intended to reflect actual population densities in the Project Area, but are used in relative comparisons of the alternatives. They should be interpreted as an index of risk for ranking the alternatives. This chapter displays habitat capability values for MIS in the Project Area for pre-logging (1954) and existing conditions (1995).

Because of the amount of timber harvest on private land, a worst-case scenario was assumed and no habitat capability was calculated for inclusions of state, private, or encumbered lands within the Project Area in *Wildlife* in Chapters 3 and 4. The cumulative effects analysis in *Subsistence* includes activities occurring on the state, private, and encumbered lands both within and outside of the Project Area. The wildlife habitat capability of these lands was included in the estimates.

Sitka Black-tailed Deer

Sitka black-tailed deer are indigenous to coastal regions of Southeast Alaska and British Columbia, and occupy the northwestern-most extension of the range of mule and black-tailed deer (Regelin 1979, Wallmo 1981). Consequently, the species is believed to be more sensitive to habitat modifications than deer populations in more southerly latitudes (Merriam 1970). Sitka black-tailed deer are also a major recreation and subsistence big game species in Southeast Alaska, with as many as 18,546 animals harvested annually; up to 18 percent of the annual harvest occurs on Prince of Wales Island and adjacent islands (TLMP Draft Revision 1991a).

The Sitka black-tailed deer is an MIS of the Tongass National Forest that uses lower elevation old-growth forests during the winter period, especially when snowfall accumulations are high (Suring et al. 1991, TLMP Draft Revision 1991a). Winter is considered the most critical season for deer survival (Suring et al. 1991).

The capability of winter habitat to support Sitka black-tailed deer is a function of forage abundance and quality (Hanley et. al. 1987), snow interception qualities of the overstory (Hanley and Rose 1987, Kirchoff and Schoen 1987), and climate as influenced by aspect, elevation, and maritime conditions (Hanley and Rose 1987). Deer populations also respond to predation pressure and hunting mortality. Predation by gray wolves is thought to significantly retard the recovery of the deer herd from mortality resulting from deep snow winters (Smith et al. 1986). In most cases, timber harvest reduces the long term quality of deer winter range. The combination of deep-snow winters and large amounts of winter range converted to second-growth compounds impacts to deer populations. Even under unlogged conditions, a deep-snow winter can kill many deer. Clearcuts and second-growth provide little snow interception above forage and, therefore, greatly increase effects of snow. Winter severity of an area is a key factor in determining the capability of the land to support deer populations.

Winter range on Prince of Wales Island which is the highest value to deer consists of: (1) mature Sitka spruce and western hemlock commercial forest with volume of 30,000 board feet or more per acre; (2) elevation below 800 feet; and (3) south, east, or west aspect (Kessler 1982, Hanley et al. 1989). Optimum winter deer habitat during deep-snow conditions includes low elevation; high volume; old-growth on well-drained sites characterized by large, irregularly, spaced trees; and an understory of abundant dwarf dogwood (*Cornus canadensis*), five-leaf bramble (*Rubus pedatus*), and *Vaccinium* spp. (Kessler 1982, Hanley et al. 1989). Although deer in Southeast Alaska are generally believed to be an old-growth-dependent species (Suring et al. 1991, Kessler 1982), they do forage in young growth, particularly during mild winters (DellaSala et al. 1992) as well as during the spring (Kessler 1982). Newly cutover areas in Southeast Alaska provide increased forage production of herbaceous plants and shrubs, although this short-lived pulse in forage biomass declines within 15 to 20 years as forest canopies begin to close (Alaback 1982, 1984). Mankowski and Peek (1989) and Yeo and Peek (1992) documented a decline in deer use of clearcuts before a loss of forage. Residential logging slash restricts deer from using clearcuts (Mankowski and Peek 1989, Wallmo and Schoen 1980, Kirchhoff et al. 1983). Mankowski and Peek (1989) found that slash levels (depth and cover) are significantly higher in clearcuts than old growth until harvest units reach 15 to 20 years old.

Sitka black-tailed deer are capable of utilizing all habitat types within the Project Area. Signs of deer activity (i.e., pellets, browse, deer) were present in most of the proposed harvest units. Habitat capability for Sitka black-tailed deer has already declined about 20 percent in the Project Area from pre-logging conditions (1954), with the majority of the decline having

occurred in WAA 1317. The Project Area has a capability of 3,200 deer under 1995 existing conditions (Table 3-29). Deer habitat capability was highest in WAA 1214 and lowest in WAA 1107, which contained only two VCU's.

An analysis of deer winter range resulted in HSI values from 0 to 0.64. HSI values were limited to this range because of the interaction of predation and winter severity as determined by the habitat capability model. HSI scores were then grouped into four categories of winter range quality: high (HSI more than 0.35), mid (HSI between 0.2 to 0.35), low (HSI less than 0.2), and unsuitable (HSI = 0). These winter range quality categories are defined for the Polk Inlet Project Area only, and are based on area-specific model results. Based on this ranking system, each of the Project Area WAA's and VCU's was evaluated for deer winter range quality. Under existing conditions, most of the high- and mid-quality winter range in the Project Area occurs in WAA 1214 (Table 3-30). High- and mid-quality winter range primarily reflect the availability of high- and mid-volume old growth with suitable slopes, aspect, and elevation as defined by the habitat capability model. In contrast, WAA 1107 has the smallest amount of high-quality winter range and most low-quality winter range occurs in WAA 1317 (detailed maps depicting the distribution of winter range within the Project Area are found in Appendix C).

Table 3-29

Sitka Black-tailed Deer Habitat capability under Pre-logging and Existing Conditions in the Polk Inlet Project Area[1/]

WAA	Pre-logging 1954[2/]	Existing Condition 1995[2/3/]
1107	107	73
1213	582	542
1214	1,633	1,429
1317	1,544	901
1332	350	255
Total	4,216	3,200
% Change from 1954		-24
PSE Index	(.956)	(.902)

SOURCE: Tongass Sitka black-tailed deer model (Suring et al. 1991), with patch size effectiveness, utilizing information from Forest Service, Ketchikan Area, database.

1/ Numbers incorporate patch size effectiveness (PSE) reductions.

2/ Only that portion of each WAA within the Project Area is included.

3/ Assumes all 1989-94 units have been harvested.

Table 3-30

Acres of Low, Mid, and High Quality Winter Range for Sitka Black-tailed Deer by Project Area WAA Under Pre-logging and Existing Conditions

	Low Quality[1/]		Mid Quality[2/]		High Quality[3/]	
WAA	1954[4/]	1995[5/]	1954[4/]	1995[5/]	1954[4/]	1995[5/]
1107	2,141	2,641	280	240	800	340
1213	5,809	5,909	2,684	2,684	4,946	4,847
1214	27,279	29,440	8,227	7,887	11,250	9,429
1317	18,542	27,494	6,613	6,254	13,289	4,697
1332	7,390	8,928	1,398	1,158	2,277	979
Total	61,161	74,412	19,202	18,223	32,562	20,292

SOURCE: Tongass deer model (Suring et al. 1991), utilizing information from Forest Service, Ketchikan Area, database.

1/ Low quality winter range: HSI <0.2.

2/ Mid quality winter range: HSI 0.2 to 0.35.

3/ High quality winter range: HSI >0.35.

4/ Pre-logging conditions.

5/ Assumes all 1989-94 units have been harvested.

In general, the amount of low quality deer winter range throughout the Project Area has increased substantially (22 percent) from pre-logging to existing conditions, and this shift has occurred primarily at the expense of high quality winter range (Table 3-31). Mid quality winter range has declined by about 5 percent from pre-logging conditions throughout the Project Area. The largest percent reductions have occurred in WAA's 1332 and 1107, while the largest number of total acres lost was in WAA 1317. High quality winter range has experienced the greatest reduction of any of the winter range categories. High quality winter range has declined by about 38 percent of 1954 pre-logging conditions with the highest percent declines occurring in WAA's 1317, 1107, and 1332 (Table 3-30).

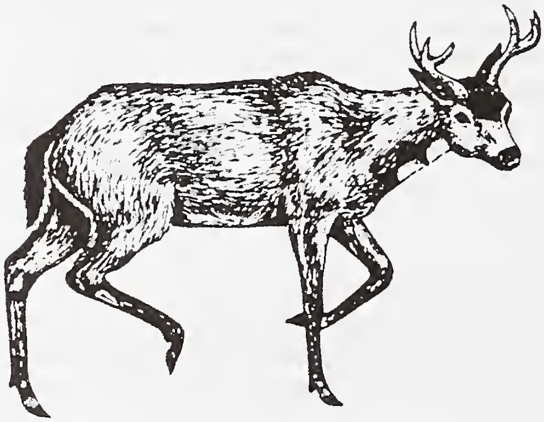


Table 3-31
Acres of Low, Mid, and High Quality Winter Range for Sitka Black-tailed Deer by VCU Under Existing Conditions

VCU	Low Quality 1995[1/]	Mid Quality 1995[1/]	High Quality 1995[1/]
610	4,617	859	540
611	2,121	740	720
612	3,581	740	620
613	9,443	2,082	921
618	4,505	2,022	3,183
619	2,703	1,101	1,582
620	9,209	1,942	3,123
621	13,289	2,078	2,359
622	9,828	2,737	1,238
624	8,928	1,158	979
674	3,322	1,841	3,863
675	2,867	923	1,164
Total	74,413	18,223	20,292

SOURCE: Forest Service, Ketchikan Area, database.

1/ Assumes all 1989-94 units have been harvested.

Deer winter range was also evaluated for each of the Project Area VCU's (Table 3-31). Under existing conditions, most mid- and high-quality winter range occurs in VCU's 674, 618, 620, and 622 which are closest to coastal areas such as Cholmondeley Sound, MacKenzie Inlet, Polk Inlet, and Twelvemile. In contrast, low-quality winter range occurs primarily in VCU's with extensive areas of winter range in the seedling/sapling size class. In particular, VCU 621 has the greatest amount of low-quality winter range.

Black Bear

Black bears are considered common in Southeast Alaska, and the density on Prince of Wales Island is estimated at 0.23 bears per square mile (Suring et al. 1988b). Black bears are considered highly adaptable to habitat modification, providing suitable food and cover are present (Lawrence 1979) and human-related disturbance (e.g., illegal hunting) is minimal (Suring et al. 1988b). The capacity of an area to support bears is further limited by the presence of human structures, including open-pit dumps, cabins, permanent camp sites, float camps, airstrips, roads, hiking trails, and off-road vehicle trails (Suring et al. 1988b).

Black bears are highly mobile and use a variety of different habitat types and forest age classes. However, bears prefer large expanses of habitat and protection from human disturbances (TLMP Draft Revision 1991a, Lawrence 1979). Older forest types in Southeast Alaska provide black bear with den sites and succulent plants such as skunk cabbage (*Lysichitum americanum*) in the spring and with berries in the fall (Suring et al. 1988b). Low- to mid-volume timber is considered suitable bear habitat because of high berry production and availability of den sites (Suring et al. 1988b). Older forest types with poorly drained soils such as muskegs are also important since they provide bear with valuable food sources such as skunk cabbage (Suring

et al. 1988b). Young growth can also provide valuable forage habitat for bears during the early stages of forest succession following logging. However, bears avoid clearcuts until forage species are well established which, for productive sites in Southeast Alaska, occurs within 2 to 3 years following logging (Suring et al. 1988b).

Black bears are wide ranging and capable of using all of the habitat types in the Project Area. Signs of bear activity (e.g., bear scat, bears, and foraging signs) were observed throughout the Project Area, especially in wet areas containing skunk cabbage (e.g., muskegs) and estuarine area. Habitat capability in the Project Area has declined by 24 percent from the pre-logging conditions in 1954. The largest decline occurred in WAA's 1214 and 1317 and is due to past and current timber harvest in the area. The Project Area has a habitat capability of 229 black bears under 1995 existing conditions (Table 3-32). Bear habitat capability was highest in WAA 1214 and lowest in WAA 1107.

Table 3-32

Black Bear Habitat capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area[1/]

WAA	Pre-logging 1954[2/]	Existing Condition 1995[2/3/]
1107	8	6
1213	42	40
1214	125	97
1317	102	68
1332	25	18
Total	302	229
% Change from 1954		-24
Disturbance Factor Index[4/]	(1.000)	(.835)

SOURCE: Tongass black bear model (Suring et al. 1988) incorporating disturbance reduction factor, utilizing information from Forest Service, Ketchikan Area, database.

1/ Numbers incorporate disturbance factor reductions.

2/ Only that portion of each WAA within the Project Area is included.

3/ Assumes all 1989-94 units have been harvested.

4/ Average reduction factor to account for disturbance associated with roads.

Marten

Widespread trapping of marten and overharvesting of mature forests contributed to the elimination of this species throughout the southern and eastern portions of their original range in the conterminous United States (Bergerud 1969, Dodds and Martell 1971, Strickland et al. 1982). Martens, however, are considered "reasonably dense" in Southeast Alaska (Johnson 1981).

Although they are capable of using a variety of forest habitats, martens prefer mature conifer or mixed forests (Soutiere 1979). Because of the close association of martens with older forest types (Suring et al. 1991), this species is considered an indicator of low elevation, old-growth areas on the Tongass National Forest (TLMP Draft Revision 1991a).

Marten habitat use in western coniferous forests is related to canopy cover, availability of suitable resting and denning sites, and prey abundance (Buskirk et al. 1989). In general, these characteristics are positively correlated with timber volume class (Suring et al. 1991). Optimal forest cover for martens in Southeast Alaska is generally considered to occur in mature forests with 60 to 80 percent canopy cover (Spencer et al. 1983, Bateman 1986, Suring et al. 1988c).

Open roads through marten habitat increase opportunities for trappers to harvest this species. High marten populations are usually associated with locales having restricted human access, such as roadless areas, or where trapping pressure is strictly regulated. Marten are easily trapped and their populations decline more drastically when road densities approach 0.6 miles/sq. mile (mi/mi^2) (Suring et. al. 1991). Road densities within Project Area VCU's under existing conditions range from 0.0 to 1.5 mi/mi^2 and average 0.7 mi/mi^2 for the Project Area (see *Transportation and Facilities* in this chapter).

Signs of marten activity (e.g., footprints) were observed in a few of the proposed harvest units, but the inconspicuous behavior of this species makes it difficult to detect without the use of more elaborate sampling designs. Marten habitat capability has declined in the Project Area approximately 22 percent from pre-logging conditions in 1954, with most of the decline occurring in WAA 1317. This initial reduction in habitat capability is attributed to past timber harvest in the Project Area. The Project Area has a habitat capability of 192 marten under 1995 existing conditions (Table 3-33). Marten habitat capability was highest in WAA 1214 and lowest in WAA 1107.

Table 3-33

Marten Habitat capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area1/

WAA	Pre-logging 1954 2/	Existing Condition 1995 2/3/
1107	6 (6) 4/	4 (2)
1213	32 (32)	31 (31)
1214	97 (97)	85 (9)
1317	91 (91)	58 (6)
1332	21 (21)	14 (1)
Total	247(247)	192 (49)
% Change from 1954		-22
PSE Index	(.974)	(.943)

SOURCE: Tongass marten model with patch size effectiveness (Suring et al. 1992), utilizing information from Forest Service, Ketchikan Area, database, updated.

1/ Numbers incorporate patch size effectiveness (PSE) reductions.

2/ Only that portion of each WAA within the Project Area is included.

3/ Assumes all 1989-94 units have been harvested.

4/ Numbers in parentheses represent habitat capability after being reduced by the road density index and probably overestimate the effect of roads because they are based on average road densities over an entire WAA.

Alexander Archipelago Wolf

Gray wolves have been eliminated throughout most of the lower 48 states because of predator control programs and habitat loss (Nowak 1991). Overall populations of wolves are considered stable to increasing in Alaska (Townsend 1986), but there is concern that excessive hunting and oil and mineral exploitation could adversely affect wolves through reductions in prey populations (Suring et al. 1988d). About 4,000 to 7,000 wolves are harvested annually in Alaska (Carbyn 1983, 1987). Kirchhoff (1992) reports a strong relationship between road density and the presence or absence of wolves. Where extensive road systems exist, wolves will be at additional risk from increased access by hunters and trappers; in one study wolves generally were not present where open road densities exceeded 0.93 mi/mi^2 (Mech et al. 1988). However, other work has suggested that wolves could exist in areas with higher road densities if these areas were adjacent to roadless areas (Mech et al. 1988). Road densities in the Project Area under 1995 existing conditions range from a low of .25 mi/mi^2 in VCU 611 to a high of 1.51 mi/mi^2 in VCU 624, with an average for the Project Area of .73 mi/mi^2 (see *Transportation and Facilities* in this chapter.

Wolves have the greatest natural range of any terrestrial mammal other than humans (Nowak 1991) and do not appear to exhibit any particular preference for specific habitat types (Paradiso and Nowak 1982). Instead, wolf distribution and population dynamics are regulated primarily by prey distributions and intrinsic social factors (Packard and Mech 1980, Potvin 1988). Therefore, as an MIS, the wolf is representative of a top-level carnivore.

Signs of wolf activity (e.g., footprints, howling) were observed in several of the harvest units. Wolf habitat capability, under existing conditions (1995), has declined 27 percent from pre-logging conditions in 1954. WAA 1317 experienced the greatest declines in capability

from past harvest. Habitat capability was generally low for the Project Area and ranged from less than 1 wolf for WAA 1107 to about 5 wolves for WAA 1214 (Table 3-34).

Table 3-34
Gray Wolf Habitat Capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area[1/]

WAA	Pre-logging 1954[2/]	Existing Condition 1995[2/3/]
1107	0.4	0.3
1213	2.5	1.9
1214	5.9	5.1
1317	5.5	3.2
1332	1.3	0.9
Total	15.6	11.4
% Change from 1954		-27

SOURCE: Tongass gray wolf model (Suring et al. 1988d), utilizing information from Forest Service, Ketchikan Area, database.

1/ Numbers incorporate patch size effectiveness reductions for deer.

2/ Only that portion of each WAA within the Project Area is included.

3/ Assumes all 1989-94 units have been harvested.

River Otter

River otters were historically numerous across the majority of North America (Hall and Kelson 1959). Habitat alteration and extensive trapping pressure have been responsible for widespread population declines throughout most of the range of this species (Suring et al. 1988e). River otter populations, however, are considered stable or believed to be increasing in Alaska (Suring et al. 1988e).

River otters use a variety of habitats but are most closely associated with aquatic areas (Suring et al. 1988e). Prince of Wales river otters are endemic to Southeast Alaska, and otter activity for most of the year tends to be highest within 100 feet of the shoreline, but during the breeding season female otters may move to inland habitats within 0.5 mile of coastal areas in search of natal den sites (Larsen 1983, Woolington 1984 in Suring et al. 1988e). Natal dens occur on well-drained sites usually near streams in old-growth forest. Streams are used as travel corridors between natal dens and foraging areas on the coastline (Suring et al. 1988e). Otters tend to select older forest types that are relatively free from extensive vegetation debris and dense shrub growth and with a canopy closure of greater than 50 percent (Suring et al. 1988e).

River otter habitat capability showed a decline of 18 percent from pre-logging conditions (1954). These reductions were primarily due to past harvest in beach and estuary fringes. WAA 1317, because of the concentration of past harvest activity in this area, showed the greatest reductions. The Project Area has a habitat capability of 42 river otter under 1995 existing conditions (Table 3-35). Otter habitat capability was highest in WAA 1214 and lowest in WAA 1107.

Table 3-35

River Otter Habitat capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area

WAA	Pre-logging 1954 1/	Existing Condition 1995 1/2/
1107	0	0
1213	9	9
1214	24	21
1317	17	11
1332	1	1
Total	51	42
% Change from 1954		-18

SOURCE: Tongass river otter model (Suring et al. 1988e), utilizing information from Forest Service, Ketchikan Area, database, updated.

1/ Only that portion of each WAA within the Project Area is included.

2/ Assumes all 1989-94 units have been harvested.

Vancouver Canada Goose

The Vancouver Canada goose is considered an uncommon (Gibson 1976) or common (Armstrong 1991) resident species throughout the Alexander Archipelago (Gibson 1976, TLMP Draft Revision 1991a). The Forest Service estimates that a resident population of about 10,000 birds occurs in the northern half of Southeast Alaska (Hodges and Conant 1986). Most (98 percent) of these birds have been reported within the breeding grounds during the winter and are apparently nonmigratory (Ratti and Timm 1979). Lebeda and Ratti (1983) found that the three most important factors for nesting Vancouver Canada geese are: (1) dense understory vegetation, (2) forest surface water, and (3) an abundant food source. The Vancouver Canada goose is unique among Canada goose subspecies in its use of coniferous forested habitat (Lebeda and Ratti 1983, Mickelson 1984). The species is closely associated with old-growth forests that are primarily used for nesting and brood rearing. Critical time periods for nesting Vancouver Canada geese in Southeast Alaska are: (1) pre-incubation, April 18 to 23, and (2) incubation, April 24 to June 7 (Lebeda and Ratti 1983).

Vancouver Canada geese were observed in a few locations in the Project Area, primarily near shoreline areas or lakes in the vicinity of proposed harvest units. Areas nearest the Project Area where geese have been reported include Trocadero Bay just west of VCU 624, Twelvemile, and Dog Salmon Creek. Goose habitat capability in the Project Area has declined by 14 percent from 1954 pre-logging conditions and most of the decline has occurred in WAA 1317. The Project Area has a habitat capability of 377 geese under 1995 existing conditions (Table 3-36). Goose habitat capability was highest in WAA 1214 and WAA 1317 and lowest in WAA 1107.

Table 3-36
Vancouver Canada Goose Habitat Capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area[1/]

WAA	Pre-logging 1954[1/]	Existing Condition 1995[1/2/]
1107	13	10
1213	56	56
1214	174	156
1317	153	121
1332	44	34
Total	440	377
% Change from 1954		-14

SOURCE: Tongass Vancouver Canada goose model (Doyle et al. 1988) utilizing information from Forest Service, Ketchikan Area, database.

1/ Only that portion of each WAA within the Project Area is included.

2/ Assumes all 1989-94 units have been harvested.

Bald Eagle

In Alaska, the bald eagle is common in coniferous forests, deciduous woodlands, rivers and streams, beaches and tidal flats, and rocky shores and reefs (Gibson 1976, Armstrong 1991). Some of the highest quality bald eagle nesting habitat and highest nesting densities in North America occur in Southeast Alaska. Nesting populations in Southeast Alaska over a 20-year period ranged from 7,230 in 1967 to 12,074 in 1987 (Stalmaster 1987, Jacobson 1989); nesting densities as high as one eagle nest per 0.6 mile have been reported in some areas (e.g., Seymour Canal Eagle Management Area, Hodges 1982). Bald eagle nesting concentrations on Prince of Wales Island are also considered high, with as many as 900 nest sites located within the last 2 decades (DellaSala et al. 1992). Nest occupancy rates on the island generally range from 20 to 40 percent of the total nest sites each year (DellaSala et al. 1992).

Bald eagles in Southeast Alaska nest primarily in old-growth forest below the 800-foot elevation (Suring et al. 1988f, TLMP Draft Revision 1991a). Nest sites are almost always associated with old-growth areas along the coastline and associated saltwater inlets; clearcuts without sufficient remnant trees are avoided (Hodges et al. 1984). Continuous old-growth stands with tall, well-developed canopy structure and high percentage of Sitka spruce in the overstory provide suitable nesting habitat for bald eagles (Hodges and Robards 1981). Usually these conditions occur in stands with timber volume greater than 8,000 board feet per acre. Bald eagle nest sites are almost always in proximity of shoreline areas. Nest sites are most commonly located on points of land, small islands, narrow passages with tidal currents, and shorelines exposed to large waterbodies.

Although the response of eagles to human activities in the vicinity of nest sites is highly variable and dependent on a number of factors, human activities are known to result in reductions in nesting productivity and nest-site abandonment (Anthony and Isaacs 1989, Stalmaster et al. 1984, Fraser et al. 1985). Disturbances to nesting eagles are most critical

Bald eagle

during the egg-laying and incubation stages (Stalmaster et al. 1984). All nest sites are considered to be potentially active between March 1 and May 31, from June 1 to August 31 only those sites with eggs, young, or attendant paired adults are susceptible to disturbance.

To minimize disturbance impacts to nesting eagles, nest-site buffer zones have been widely used in areas of human activity. The Pacific Bald Eagle Recovery Plan (USFWS 1986), which applies to a seven-state region where the eagle is Federally listed under the Endangered Species Act (ESA), requires restrictions on logging within 0.25 mile of active eagle nest sites with adequate screening and 0.5 mile of nest sites that lack screening. However, research has indicated that this zoning approach often is inadequate and does not fully protect nesting territories (Stalmaster et al. 1984, Fraser et al. 1985). Consequently, the buffer zone approach is currently under review in the seven-state Pacific Recovery Area and research is underway on Prince of Wales Island to determine its effectiveness in protecting eagle nest sites from human intrusion (personal communication, R. Anthony, Bald Eagle Recovery Team, Oregon State University, Corvallis, Oregon, March 1, 1992). The Forest Service in Southeast Alaska has an Interagency Agreement with the U.S. Fish and Wildlife Service (USFWS) to restrict logging within a 330-foot buffer surrounding eagle nest sites. If Forest Service activities encroach on the established buffer, the Forest Service will request, in writing, a variance from the USFWS. In addition, the Forest Service maintains a 1/4-mile helicopter disturbance buffer and a 1/2-mile blasting buffer around nests during the breeding season.

A total of 78 eagle nest sites were located by the U.S. Fish and Wildlife Service (USFWS) during nest-site surveys of the Project Area; 48 of these were on lands administered by the Forest Service (Table 3-37). The majority of these nest sites occur in VCU's nearest shoreline areas, including VCU's 621, 674, 618, 611, 619, and 620. Information on the status of these nest sites was unavailable and therefore could not be compared directly to habitat capability values for standardization of habitat models.

Table 3-37
Bald Eagle Habitat capability Under Pre-logging and Existing Conditions and Number of Eagle Nest Sites in the Polk Inlet Project Area

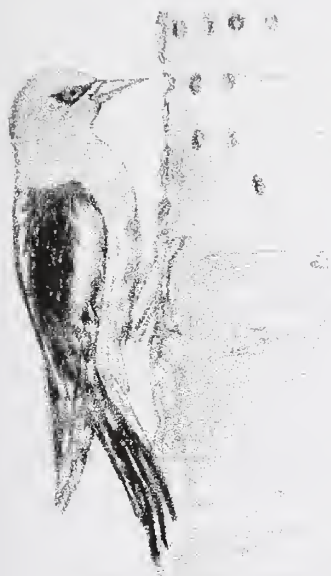
WAA	Pre-logging 1954 1/	Existing Conditions 1995 1/ 2/	Nest Sites on Forest Service Lands 1/ 3/	Nest Sites on All Lands 1/ 4/
1107	1	1	0	0
1213	33	31	9	17
1214	82	67	22	32
1317	60	27	17	29
1332	3	2	0	0
Total	179	128	48	78
% Change from 1954		-28		

SOURCE: Tongass bald eagle model (Suring et al. 1988f), utilizing information from Forest Service, Ketchikan Area, database.

1/ Only that portion of each WAA within the Project Area is included.
2/ Assumes all 1989-94 units have been harvested.
3/ No. nest sites (status unknown) on lands managed by the Forest Service, excluding encumbered lands, in Project Area.
4/ Number of nest sites (status unknown) on all Project Area lands, including encumbered, state, and private.

Eagle habitat capability in the Project Area has declined 28 percent from 1954 pre-logging conditions. This initial decline was due to past harvest of nesting habitat in the beach and estuary fringes, and riparian habitats, with most of the harvest occurring prior to harvest under the 1989-94 EIS. The Project Area has a habitat capability of 128 eagles under 1995 existing conditions (Table 3-37). Eagle habitat capability is highest in WAA 1214 and lowest in WAA 1107.

Red-breasted Sapsucker



Red-breasted sapsuckers are associated with coniferous forests in Southeast Alaska, western British Columbia, and western Washington at elevations below 2,000 feet. The species occurs throughout Southeast Alaska from spring to early fall, and winters in the coastal portions of its breeding range as far north as Prince of Wales Island (Suring et al. 1988g). Red-breasted sapsuckers have commonly been observed in old-growth forest during the breeding season in the north Prince of Wales Island province but not during the winter (DellaSala et al. 1992). Red-breasted sapsuckers are a "keystone" species that excavate cavities used by secondary cavity nesters in subsequent years. Consequently, impacts to this species affect the guild of cavity nesters that utilize abandoned woodpecker holes as nest and roost sites.

Optimum use of nesting areas by sapsuckers occurs in old and mature-forest habitats that are greater than 250 acres, with use declining with decreasing patch size (Raphael 1984, TLMP Draft Revision 1991a). Red-breasted sapsuckers in Southeast Alaska are approximately twice as abundant in low-volume (8 to 20 MBF per acre) as in mid- (20 to 30 MBF per acre) and high-volume stands (greater than 30 MBF per acre) (Hughes 1985 in Suring et al. 1988g). The species also seems to prefer lower volume old-growth, spruce-hemlock forests in Southeast Alaska compared to other forest types, including muskeg and deciduous forest (Kessler 1979, Suring et al. 1988g). Although smaller size classes are also used for nesting, larger diameter trees appear to increase nesting productivity (Raphael and White 1984). Sapsuckers usually nest in trees with advanced decay in the heartwood (Suring et al. 1988g, Erskine and McLaren 1972) that are either live or have been dead for less than 3 years (Bull et al. 1986).

While red-breasted sapsuckers are primarily associated with older forest types, the species has been reported using clearcuts in some drainages of Southeast Alaska (Kessler and Kogut 1985, DellaSala et al. 1992), but not in others (Reid et al. 1980). This is especially true when snags have been retained in the logging unit (Franzreb 1977, Tobalske et al. 1991).

Past timber harvest has resulted in a decline of sapsucker habitat capability of 19 percent from pre-logging (1954) conditions, with the largest decline occurring in WAA 1312. The entire Project Area is capable of potentially supporting 10,762 sapsuckers under 1995 existing conditions (Table 3-38). Sapsucker habitat capability was highest in WAA 1214 and lowest in WAA 1107.

Table 3-38
Red-breasted Sapsucker Habitat capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area[1/]

WAA	Pre-logging 1954[2/]	Existing Condition 1995[2/3/]
1107	378	283
1213	1,782	1,718
1214	5,539	4,799
1312	4,660	3,282
1332	976	680
Total	13,335	10,762
% Change from 1954		-19
PSE Index	(.975)	(.946)

SOURCE: Tongass red-breasted sapsucker model (Suring et al. 1988g), utilizing information from Forest Service, Ketchikan Area, database.

1/ Numbers incorporate patch size effectiveness (PSE) reductions.

2/ Only that portion of each WAA within the Project Area is included.

3/ Assumes all 1989-94 units have been harvested.

Hairy Woodpecker

The hairy woodpecker is associated with coniferous and deciduous forest types throughout North America (Peterson 1961). In Southeast Alaska, hairy woodpeckers are considered uncommon, permanent residents of conifer forests (Gibson 1976, Sidle and Suring 1986, Armstrong 1991) that reach peak numbers in old-growth forests (Suring et al. 1988i). Hairy woodpeckers have been observed in low numbers in old-growth and second-growth stands year round in the north Prince of Wales Island province (DellaSala et al. 1992). The hairy woodpecker is also considered a keystone species that provides essential nesting cavities for a variety of secondary cavity users. Consequently, impacts to this species also affect the guild of cavity nesters that rely on abandoned woodpecker holes for nesting and roosting.

Optimum use of a stand by hairy woodpeckers occurs in old growth greater than 500 acres, with use declining with decreasing patch size (Raphael 1984, TLMP Draft Revision 1991a). Hairy woodpeckers in Southeast Alaska prefer high volume (30 MBF per acre) old-growth (Suring et al. 1988h). This relationship between hairy woodpecker abundance and contiguous, high volume forests may explain the population declines reported for this species throughout the Pacific Northwest, particularly where timber harvest has been extensive (Suring et al. 1988h). Consequently, hairy woodpeckers may be an indicator of the degree of habitat fragmentation associated with logging in high volume, old-growth forest.

Hairy woodpeckers are dependent on the availability of suitable snags for nesting; nesting densities are known to be positively correlated with snag densities (Dickson et al. 1983, Raphael and White 1984). Therefore, the retention of reserve trees as snags during clearcutting and thinning can lessen logging impacts on this and other cavity-nesting species.
Hairy woodpecker habitat capability has declined 45 percent from pre-logging (1954) conditions (Table 3-39). The entire Project Area is capable of potentially supporting 1,370 hairy woodpeckers under 1995 existing conditions. Woodpecker habitat capability was highest in WAA 1214 and lowest in WAA 1107.

Table 3-39

Hairy Woodpecker Habitat capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area[1/]

WAA	Pre-logging 1954[2/]	Existing Condition 1995[2/3/]
1107	75	26
1213	311	293
1214	965	624
1317	913	364
1332	234	63
Total	2,498	1,370
% Change from 1954		-45
PSE Index	(.963)	(.920)

Source: Tongass hairy woodpecker model (Suring et al. 1988), utilizing information from Forest Service, Ketchikan Area, database.

1/ Numbers incorporate patch size effectiveness (PSE) reductions.

2/ Only that portion of each WAA within the Project Area is included.

3/ Assumes all 1989-94 units have been harvested.

Brown Creeper

Brown creepers are considered uncommon permanent residents throughout Southeast Alaska (Armstrong 1991). Brown creepers are associated with old-growth, spruce-hemlock forests and reach peak densities in high volume (greater than 30 MBF per acre) stands in Southeast Alaska; densities as high as 14 birds per square mile have been reported for high volume stands compared with 2 birds per square mile in low volume (Suring et al. 1988i). Studies of brown creepers elsewhere (Scott and Gottfried 1983) and on Prince of Wales Island (DellaSala et al. 1992) report low creeper densities in logged areas.

Timber management activities that convert mixed conifers to monotypic stands are believed to affect foraging substrates of bark-foraging species, which may account for population declines in this group (Morrison et al. 1985). Furthermore, both precommercial and commercial thinning of small undesirable tree species typically remove much of the understory trees that could affect insect abundance (Morrison et al. 1985). Therefore, maintenance of reserve trees consisting of high tree species diversity and a representation of pre-logging tree size classes in logging units are essential to provide foraging opportunities for bark-foraging species such as brown creepers.

Brown creeper habitat capability in the Project Area has declined 56 percent from pre-logging conditions (1954), and most of the decline occurred in WAA 1317. The entire Project Area is capable of potentially supporting 2,548 brown creepers under 1995 existing conditions (Table 3-40). Brown creeper habitat capability was highest in WAA 1214 and lowest in WAA 1107.

Table 3-40

Brown Creeper Habitat capability Under Pre-logging and Existing Conditions in the Polk Inlet Project Area

WAA	Pre-logging 1954[1/]	Existing Condition 1995[1/2/]
1107	191	42
1213	707	690
1214	2,293	1,330
1317	2,077	434
1332	574	52
Total	5,840	2,548
% Change from 1954		-56
PSE Index	(.997)	(.994)

SOURCE: Tongass brown creeper model (Suring et at. 1988i), utilizing information from Forest Service, Ketchikan Area, database.

1/ Only that portion of each WAA within the Project Area is included.

2/ Assumes all 1989-94 units have been harvested.

Threatened, Endangered, and Sensitive Species

Key Terms

Category 2 Candidate—a species or group of species being considered by the U.S. Fish and Wildlife Service for listing as endangered or threatened, but for which conclusive data is lacking on its biological vulnerability and degree of threat.
Category 3 Candidate—species that are now considered to be more abundant and/or widespread than previously thought.
Endangered—a species in danger of extinction throughout all or a significant portion of its range.
Haul out—area of large, smooth, exposed rocks used by seals and sea lions for resting and pupping.
Sensitive—species (identified by the Regional Forester) whose population viability is of concern on national forests within the region, and which may need special management to prevent their being placed on State and Federal threatened and endangered species lists.
Threatened—a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Introduction

Federally listed threatened and endangered species are those plants and animals formally listed by the USFWS or the National Marine Fisheries Service (NMFS), under the authority of the Endangered Species Act (ESA) of 1973, as amended. Candidate species are those being considered for listing as threatened or endangered by the USFWS or NMFS. The State of Alaska has an Endangered Species Law which authorizes the Commissioner of the ADF&G to list Alaska endangered species. The Regional Forester has also designated species as "sensitive." Sensitive species are those plant and animal species whose population viability is a concern, or current populations and/or habitats are reduced or restricted, are considered vulnerable to various management activities, and special management emphasis is needed to prevent the species from becoming threatened or endangered. A full biological assessment and biological evaluation has been prepared covering all threatened, endangered, sensitive, and candidate species (Appendix J).

Plants

The policy of the Tongass National Forest is to "manage plants in order to maintain viable populations and to avoid actions that may cause a plant to become listed as threatened or endangered" (TLMP Draft Revision 1991a). Plants of concern are listed by the USFWS as endangered or threatened under the ESA of 1973 or species identified as sensitive by the Regional Forester. Under the ESA, an endangered species is defined as one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Currently, no plant species native to Southeast Alaska are Federally listed as endangered or threatened. However, four species are currently considered Category 2 Candidate Threatened or Endangered Species (TLMP Draft Revision 1991a). Category 2 species have evidence supporting formal listing as threatened or endangered but adequate information is not yet available on biological vulnerability or threats to justify final listing. None of these species has been found in the Tongass National Forest so far, and potential habitat for only one of the species, thickglume reedgrass (*Calamagrostis crassiglumis*), exists within the Polk Inlet Project Area. Greater detail on these species is provided in the biological assessment and biological evaluation (Appendix J).

Sensitive plant species (as defined by the Forest Service) are identified by the Regional Forester and are species for which population viability is a concern, as evidenced by: (1) significant current or downward trends in population numbers or density, and/or (2) significant current or predicted downward trends in habitat capability that would reduce the existing distribution of a species. Currently, there are 11 species on the Region 10 list of sensitive plant species that may occur in the Project Area (see Appendix J). In addition, Region 10 and The Nature Conservancy's Alaska Natural Heritage Program have developed a state list of rare plants known to occur or considered likely to occur in the Tongass and Chugach National Forests (Forest Service 1991b, DeLapp 1992) that also includes species that are sensitive in Alaska but are stable elsewhere in their range. None of the Region 10 sensitive species are known to occur in the Project Area, although several species are suspected to occur. See the biological assessment and biological evaluation (Appendix J) for an evaluation of each species.

Fish

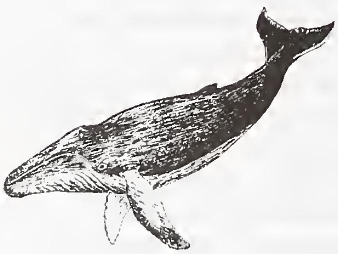
No threatened, endangered, or sensitive (TES) fish species occur in the Project Area.

Wildlife

Two Federally endangered wildlife species—the humpback whale (*Megaptera novaeangliae*) and the Eskimo curlew (*Numenius borealis*)—potentially migrate through the area and three Federally threatened species—the Aleutian Canada goose (*Branta canadensis leucopareia*), American peregrine falcon (*Falco peregrinus anatum*), and Steller sea lion (*Eumetopias jubatus*)—potentially migrate or occur in the Prince of Wales Island area. Nine additional Federal candidate species potentially occur in the area. These include the Alexander Archipelago wolf (*Canis lupus ligoni*), Prince of Wales flying squirrel (*Glaucomys sabrinus griseifrons*), arctic peregrine falcon (*F. p. tundris*), marbled murrelet (*Brachyramphus marmoratum*), Kittlitz's murrelet (*B. brevirostris*), Queen Charlotte goshawk (*Accipiter gentilis laingi*), harlequin duck (*Histrionicus histrionicus*), olive-sided flycatcher (*Contopus borealis*), and spotted frog (*Rana pretiosa*). Three additional sensitive species including Peale's peregrin falcon (*F. peregrinus pealei*), osprey (*Pandion haliaetus*), and the trumpeter swan (*Cygnus buccinator*), also potentially occur in the Project Area. All 17 of these species are evaluated in detail in the biological assessment and biological evaluation for the Project (Appendix J).

Information on TES species distributions and occurrences in the Project Area was obtained from agency contacts, a review of the available literature on TES in Southeast Alaska, and a general walk-through of each proposed harvest unit by ID survey teams. The specific methodologies are discussed in DellaSala and Volsen (1993).

Humpback Whale



Humpback whales are found in coastal areas or near oceanic islands and appear to have a preference for nearshore waters, especially the highly productive fjords of Southeast Alaska and Prince William Sound (Calkins 1986). Humpbacks remain in the Gulf of Alaska throughout the summer and fall and begin their southward migration in November; however, some humpbacks have been reported to winter in Southeast Alaska waters (Calkins 1986). The current population of humpback whales in the North Pacific is estimated at about 1,000 animals, only about 8 percent of the estimated pre-exploitation population size (Johnson and Wolman 1984). Currently, about 300 to 350 whales, or 30 to 35 percent of the entire North Pacific population of humpbacks (Calkins 1986), gather in Southeast Alaska waters during the summer and fall to feed on abundant populations of euphausiaceans (*Euphausia pacifica*), herring (*Clupea harengus*), and capelin (*Mallotus villosus*) (Johnson and Wolman 1984).

Because the humpback whale occupies nearshore waters, it is especially vulnerable to environmental degradation and human disturbances associated with off-shore petroleum exploration and production, ocean dumping, toxic chemical pollution, coastal logging, mining and manufacturing, fishing, resort development, and pleasure boat and cruise ship traffic (Johnson and Wolman 1984). Such activities may disrupt whale feeding or result in damage to important habitat areas (Johnson and Wolman 1984). Critical habitat has not been designated for humpback whales; however, Frederick Sound, which separates Kupreanof from Admiralty Island, is an area heavily used by humpbacks during the summer and fall (TLMP Draft Revision 1991a). Humpbacks may pass through the Polk Inlet area on their way to Frederick Sound (TLMP Draft Revision 1991a).

Steller Sea Lion

The Steller sea lion is widely distributed over the continental shelf and throughout the coastal waters of the Gulf of Alaska (Calkins 1986). Although population declines have been reported throughout most of the range of this species, sea lions in Southeast Alaska have experienced less dramatic population declines (TLMP Draft Revision 1991a).

The most significant factors affecting Steller sea lion populations include: (1) reductions in availability of food; (2) commercial harvest of pups; (3) subsistence harvest of sea lions; (4) harvests for public display and scientific research purposes; (5) predation by sharks, killer whales (*Orcinus orca*), and brown bear (*Ursus arctos*); (6) disease; (7) inadequate regulatory mechanisms such as quotas on incidental harvest during commercial fishing operations; and (8) other natural or human factors such as illegal shooting of adult sea lions at rookeries, haul-out sites, and in the water near boats (TLMP Draft Revision 1991a). None of these factors are regulated by or are within the jurisdiction of the Forest Service. Currently, critical habitat for Steller sea lions has not been designated. However, a Steller sea lion haul-out has been located by the NMFS on the southern point of Grindall Island just south of the Kasaan Peninsula at Baker Point (letter from S. Pennoyer, National Marine Fisheries Service, Anchorage, Alaska, February 6, 1992). The nearest log transfer facility (LTF) associated with the project occurs at Baker Point in Kasaan Bay, approximately 12 miles northeast of this haul-out, and the haul-out is currently exposed to log shipment activities originating from Forest Service and private LTF's.

American Peregrine Falcon

The American peregrine falcon is primarily associated with the boreal forest region of interior Alaska (USFWS 1982, Craig 1986). It occurs in Southeast Alaska only during migration periods (letter from N. Holmberg, USFWS, Anchorage, Alaska, March 5, 1992; Forest Service 1992c). Population declines in peregrine falcons occurred after World War II and were due primarily to reductions in breeding habitat and contamination from organochloride pesticides (USFWS 1982). However, this subspecies has recently experienced increases in population and reproduction (Forest Service 1992c [Forest Service Biological Assessment of 8 Species]), and the USFWS is currently preparing a Federal Register notice for potential downlisting.

Actual migration routes and foraging areas of peregrine falcons in Southeast Alaska have not been identified and specific use of the Project Area is unknown. However, the Project Area is within the migratory pathway of peregrine falcons and peregrines potentially migrating through the area probably forage on prey species that they are known to use elsewhere, including shorebirds, waterfowl, and songbirds (Anderson et al. 1980). Marshes and riparian areas are particularly important peregrine feeding areas, since they attract and concentrate prey species (Craig 1986).

Eskimo Curlew

Eskimo curlews once ranged from arctic North America to southern South America, migrating seasonally by way of the Atlantic and Central flyways (Gollop 1988). The species formerly occupied western and northern Alaska, but is now considered an accidental in Alaska (Armstrong 1991) and one of the rarest birds in North America (Gollop 1988). Eskimo curlews migrate along the Alaskan interior and any occurrences along coastal regions are highly unlikely (Armstrong 1991). The species has not been sighted in Alaska since 1986 (Armstrong 1991).

Aleutian Canada Goose

The Aleutian Canada goose nests on Buldir and Chagulak islands in the Aleutian Archipelago, and winters primarily in the San Joaquin Valley of California (Amaral 1985). The species sometimes stops along the Oregon coast and occasionally is reported along the Washington coast while on way to wintering grounds in California (Amaral 1985). Aleutian Canada geese are believed to have historically wintered from British Columbia to California (Amaral 1985). Although there are no records of Aleutian Canada geese on Prince of Wales Island, the Polk Inlet Project Area is within their migratory route (personal communication, J. Lindell, Endangered Species Coordinator, USFWS, Anchorage, Alaska, September 18, 1992). Any geese migrating in the area would likely occur along coastal wetland areas.

Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratum*) was recently listed as threatened in California, Oregon, and Washington. Marbled murrelets, however, are still abundant in Alaska where they are currently considered as a candidate for Federal listing. Populations of murrelets in Alaska are believed to number in the hundreds of thousands (Marshall 1988).

Through 1994, a minimum of 73 tree nest sites had been found in North America, including 19 in Alaska (personal communication, K. Nelson, Oregon Cooperative Wildlife Reserve Unit, Corvallis, Oregon, 1994). Nest sites have been located in mature and old-growth forests comprised of Douglas-fir, coast redwood (*Sequoia sempervirens*), western red cedar, mountain hemlock, Sitka spruce, and western hemlock (Ralph and Nelson 1992). During field investigations for the Polk Inlet Project, marbled murrelet eggshell fragment were found at three locations within the Project Area, indicating the existence of three nest sites. Subsequent examinations of surrounding trees led to the actual discovery of a marbled murrelet nest site at one of the locations. Murrelets have been observed in old-growth stands during summer dawn surveys on Prince of Wales Island, and near old-growth stands during the winter (DellaSala et al. 1992).

In 1993, marbled murrelet surveys were conducted at dawn in 29 potential harvest units in the Control Lake Project Area, just north of the Polk Inlet Project Area. Murrelet activity was recorded in 97 percent of the harvest units sampled and occupancy behavior was noted in 38 percent of them based on one survey (unpublished data).

The limited data on marbled murrelet nesting behavior are inconclusive regarding nest- site fidelity. Marshall (1988) observed a murrelet nest in California in a tree that appeared to be used over a period of several years. However, Ralph and Nelson (1992) indicate that murrelets (no location given) are not known to reuse individual nest trees. Based on high nest-site fidelity observed in other alcid species, it is highly probable that marbled murrelets at least have strong fidelity to certain forest stands that have been used for nesting (personal communication, T. Hamer, Hamer Environmental, Sedro Woolley, Washington, September 24, 1992). This is supported by recent work on murrelet nesting behavior in California where murrelets have been observed repeatedly nesting in "loose" colonies in different portions of the same forest stand (Marshall 1988, Ralph and Nelson 1992).

Three primary factors that may limit marbled murrelet reproduction or survival include removal of old-growth habitat, mortality from gill-net fisheries, and oil pollution (Marshall 1988). Information on murrelet nesting mortality indicates that this species is also highly susceptible to nest-site predation from avian predators that are associated with forest edges and fragmented landscapes. Consequently, fragmentations of contiguous old-growth areas by logging and associated predator concentrations along forest edges have the potential to adversely affect murrelet nesting success within an area (personal communication, T. Hamer, Hamer Environmental, Sedro Woolley, Washington, September 25, 1992). The TLMP Draft Revision contains a detailed explanation of existing information and is incorporated here by reference.

Marbled murrelets and murrelet broods were frequently observed foraging along inlets and coves in the Project Area, particularly along Twelvemile Arm, Polk Inlet, Cholmondeley Sound, and Clarence Straits (personal observations and personal communication, L. Kvaalen, Forest Service, Craig, Alaska, October 5, 1992). These observations, together with the surveys discussed previously, indicate that the marbled murrelet is relatively abundant on Prince of Wales Island and an estimate of 2,000 birds in the Polk Inlet Project Area may be reasonable (see Appendix J).

Queen Charlotte Goshawk

Estimated densities of goshawks (*Accipiter gentilis laingi*) in Southeast Alaska range from 0.4 to 0.9 pair per 10,000 acres of forested land having over 8 MBF/acre, with most sightings reported south of Frederick Sound (Crocker-Bedford 1992). Estimated habitat capability for goshawks ranges from 8 pairs for the South Prince of Wales Island Province to 16 pairs for the North Central Prince of Wales Island Province (TLMP Draft Revision 1991a). This represents about 2 to 4 percent of the total goshawk habitat capability for all 21 ecological provinces on the Tongass National Forest (TLMP Draft Revision 1991a). Recent estimates of the goshawk population in Southeast Alaska range from 100 to 800 pairs (Alaska Interagency Goshawk Committee, 1994). As of fall 1992, only 4 goshawk nests had been confirmed in the Tongass National Forest and 20 additional sites are probable (Forest Service memo, C. Iverson, Juneau, Alaska, October 30, 1992). The Tongass National Forest has adopted interim habitat management recommendations for the northern goshawk (letter from M. Barton, Forest Service, Juneau, Alaska, August 18, 1992). These guidelines provide for the surveying, identification, protection and monitoring of northern goshawk nest sites within the Tongass National Forest.

Preferred habitat for goshawks during the breeding season includes large tracts of mature and old-growth forests (Bartlet 1977, Hennessy 1978, Reynolds et al. 1982, Reynolds et al. 1991, Crocker-Bedford 1990a, 1990b), although a range of forest age classes has been hypothesized as essential for providing suitable prey populations in goshawk foraging territories in the southwestern U.S. (Reynolds et al. 1991). Goshawk abundance has been associated with the proportion of high volume timber and degree of habitat fragmentation in an area. A preliminary habitat model estimated that goshawks in Southeast Alaska are about 3.5 times more numerous in landscapes characterized by relatively high (84 percent) percentages of productive old-growth (>8 MBF/acre) than in landscapes with only 50 percent productive old growth (Crocker-Bedford 1990a). In addition, goshawks occur in higher numbers in contiguous stands with low levels of forest fragmentation (Woodbridge 1988). Consequently, this species may act as an indicator of the degree of forest fragmentation and proportion of high-volume timber available in a managed forest landscape. Acreages of existing old-growth forest by volume class within the Project Area under existing conditions are presented in Table 3-22. A discussion of existing levels of fragmentation within the Project Area is presented in *Biodiversity*.

A preliminary model used by the Forest Service to evaluate goshawk habitat capability under timber management alternatives indicated a possible past decline in goshawk populations of at least 30 percent in Southeast Alaska and more than 50 percent within the subspecific range of the Queen Charlotte variety (Crocker-Bedford 1990a). Population declines in goshawks are apparently related to intensive timber management (Reynolds and Wight 1982, Moore and Henny 1983, Crocker-Bedford and Chaney 1988, Kennedy 1988, Crocker-Bedford 1990a, b, Patla 1991). Consequently, the northern goshawk has been designated as a Category 2 Candidate Species for threatened or endangered status throughout its range in the United States and as a Forest Service sensitive species in the Southwest, Intermountain, and Pacific Southwest regions. Its status is currently under review in Southeast Alaska.

Twenty-one goshawk nest areas were documented in Southeast Alaska with activity between 1990 and 1993 (Titus et al. 1994). At least one nest site was located at 18 of these areas, including 8 active nests in 1993. In 1994, a total of 33 historic and current sites with at least one nest were documented; active nests were located at 21 of these sites (ADF&G 1994). Goshawk nesting has not been confirmed within the Polk Inlet Project Area.

Field verification surveys of all potential Polk Inlet harvest units were conducted in 1992 by Ebasco Environmental and subcontractor personnel. These efforts resulted in two possible observations of goshawks in the Old Franks drainage. Neither observation was associated with a particular harvest unit. Goshawk surveys, utilizing the Alaska Region goshawk survey protocol, were conducted in the Polk Inlet Project Area in 1993 by Forest Service personnel (Kvaalen and Iverson 1994). A total of 800 stations were surveyed during the nesting and fledgling period covering 20,000 acres. Six possible detections and no definite detections were recorded. No nest sites were identified. In 1994, the Forest Service surveyed or resurveyed 178 stations covering 4,450 acres: 2 possible and 1 confirmed goshawk were detected in Old Franks drainage. The confirmed observation was in Unit 613-109 from the 1989-94 Long-term Sale on August 3, 1994 (Knotts 1994). Despite several more visits to the vicinity, no further responses were detected.

Western Spotted Frog

Distribution of the spotted frog (*Rana pretiosa*) in Southeast Alaska is confined to coastal forests where it breeds in association with permanent bodies of water, including grassy margins of lakes, rivers, and streams (Hodge 1976, Broderson 1982, Nussbaum et al. 1983). Although the species is primarily aquatic (Hodge 1976, Broderson 1982, Nussbaum et al. 1983), spotted frogs have been reported moving overland in spring and summer (Behler and King 1979).

Declines in the distribution and abundance of spotted frogs have been noted in western Canada and the Pacific Northwest (McAllister and Leonard 1991), and these declines are apparently related to destruction of terrestrial and aquatic habitats and predation by bullfrogs (*Rana catesbeiana*) (Nussbaum et al. 1983, McAllister and Leonard 1991b). Consequently, spotted frogs are a Federal Candidate 2 species, and are currently being considered for listing in portions of their range (McAllister and Leonard 1991, personal communication, K. McAllister, Washington Department of Wildlife, Nongame Program, Olympia, Washington, August 18, 1992).

A sighting of a possible spotted frog occurred during site visits of proposed harvest units by ID survey teams. This frog was observed in VCU 612 near a seep (Class III) characterized by skunk cabbage, western hemlock, and western red cedar. Upon further investigation this sighting was changed to a wood frog observation.

Trumpeter Swan

Trumpeter swans winter in ice-free areas throughout Southeast Alaska (letter from C. Crocker-Bedford, Forest Service, Ketchikan, Alaska, July 2, 1991). Although information on wintering habitats and populations of trumpeter swans in Southeast Alaska is limited, in

general swans winter along estuaries, intertidal lakes, streams, and muskegs (letter from C. Crocker-Bedford, Forest Service, Ketchikan, Alaska, July 2, 1991). Wintering locations include open areas with adjoining grassflats with level terrain that allow swans to rest, feed, or fly without restricting visibility or movement. Swans wintering on Prince of Wales Island have been observed in mid-winter on snow near muskegs and tend to use areas with good winter sun exposure and protection from prevailing southeasterly winds (letter from C. Crocker-Bedford, Forest Service, Ketchikan, Alaska, July 2, 1991).

Wintering locations of trumpeter swans nearest the Project Area include Nutkwa Lagoon, approximately 3 miles south of the Project Area; Hetta Lake, approximately 3.5 miles to the southwest; Twelvemile Arm; and Kasaan Island. Small (2 to 14) concentrations of swans were reported in these areas on March 11, 1991. Wintering swans have also been observed on Old Franks Lake, near Kina Cove, near Cable Creek, and east of Polk Inlet (West 1991).

Other Candidate Species

The status of the eight remaining candidate/sensitive species is briefly summarized in the following paragraphs. These species are evaluated in detail in the biological assessment and biological evaluation for the Polk Inlet Project (Appendix J).

The Alexander Archipelago wolf is a widespread species of low abundance. It is described under Management Indicator Species in *Wildlife*.

The Prince of Wales flying squirrel is a fairly common, endemic species on Prince of Wales Island. Its habitat is primarily old-growth forests, providing adequate denning sites in snags.

The Arctic peregrine falcon occurs in Southeast Alaska only during migration. It nests north of the Brooks Range and Seward Peninsula.

The Peale's peregrine falcon nests on the outer islands west of the Project Area. It is closely associated with large seabird colonies.

The osprey occurs in low numbers throughout Southeast Alaska, but these numbers appear stable. No nest sites are known to occur in the Project Area.

Kittlitz's murrelet is distributed near glacial waters from Pt. Barrow south to at least Glacier Bay; thus, it is unlikely to occur in the Project Area. Nesting generally occurs inland above the timber line.

The harlequin duck is a fairly common resident of Southeast Alaska, nesting along fast-moving inland rivers and streams. During the winter, the harlequin duck is common to abundant in the coastal waters of Southeast Alaska.

The olive-sided flycatcher is fairly common in open forests and forest edges. It frequents riparian areas in the Project Area, including the edges around lakes and muskegs.

The Franklin's grouse (*Dendragapus canaderis franklinii*) is another species of concern in Southeast Alaska, although it is not listed as threatened, endangered, sensitive, or as a candidate. This species occurs in low densities on and near Prince of Wales Island (Gustafson 1994). A nest was observed near the head of Twelvemile Arm in the Project Area in 1903 (Osgood 1905) and an observation of a female with chicks was made in this area in harvest unit 624-230 in 1992 (Gustafson 1994). The species uses old-growth forests, especially those containing spruce, young second growth prior to canopy closure, as well as other habitats.

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Biodiversity

Key Terms

Biodiversity—the variety of lifeforms in an area, including variation in structure, composition and function at scales from genetic to landscape.
Canopy—uppermost layer of foliage in the forest.
Corridor—a patch, strip, or linear feature of habitat linking or providing connectivity between larger patches.
Edge—boundary between two distinct ecosystems, such as between forest and muskeg.
Edge effects—the biological and abiotic actions operating at edges; examples are differences in microclimate, species richness, productivity, and predation.
Fragmented—reduced in size and connectivity. The degree of fragmentation is dependent upon scale (in space and time) and species specific life requisites.
Forage—to search for food.
Patch—an assemblage of similar vegetation. In this document, the focus is on old-growth forests of greater than 8,000 board feet/acre, with only small inclusions of other habitats.
Planning area—for the purpose of analyzing viable populations, the planning area is the ecological province, i.e., North Central Prince of Wales province and South Prince of Wales province.
Snag—standing dead tree.
Viable population—the number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations well distributed throughout their range in the National Forest.

Introduction

Wildlife managers and ecologists are becoming more involved in conservation biology, which is an applied science directed towards maintaining genetic diversity of species and the integrity of ecosystems. The principles of conservation biology are being incorporated into wildlife management to maintain biodiversity. Biodiversity is important because the loss of one component of an ecological community may cause the entire community to unravel. There are many complex interrelationships among organisms which make up most communities. An example would be the important role of large trees in an old-growth forest in providing habitat for mammals, birds, and fish. As the trees die and are slowly decomposed and recycled through the ecosystem, they become inhabited by an entirely new flora and fauna.

Stand, Between Stand, and Landscape Biodiversity

Timber management activities that result in fragmentation of continuous forest blocks have been recognized as one of the major types of human impacts to biodiversity (Harris 1984). As such, it is important to understand how timber management affects biodiversity not only within the specific unit being harvested but in larger areas encompassing entire watersheds and Project Areas as well. Therefore, biodiversity needs to be examined at multiple spatial scales, including within individual harvest units, between adjacent stands, and across the entire Project Area (Whittaker 1972, Sidle 1985).

Stand-level diversity is the diversity within specific habitats or limited land areas as measured by number of species present (species richness) or structural complexity of a given habitat type (Sidle 1985). Timber harvest influences stand-level diversity through changes in the vegetative

composition, structure, and associated wildlife species of a stand. For instance, the number of breeding birds in Southeast Alaska has been shown to decline from 13 species in old-growth, spruce-hemlock forests to just 3 species immediately following logging (seedling/sapling stage) as vegetation structure and species composition is greatly simplified (Sidle 1985). As clearcuts (seedling/sapling stage) succeed to mid-successional stages (sapling/shrub and pole), species richness temporarily increases to 10 to 14 species, but declines again to 7 species in older seral stages (young sawtimber) due to the loss of understory vegetation associated with canopy closure. Retention of snags, live trees, and down woody debris can be used to enhance stand-level diversity by maintaining a portion of old-growth structure within regenerating stands (Sidle 1985, DellaSala et al. 1993).

Between-stand diversity reflects the amount of species turnover between habitat types or along environmental gradients (Sidle 1985). The spatial distribution of harvest units across an analysis area may influence the types of environmental gradients affecting between-stand diversity levels. Consequently, by clearcutting old-growth forest, timber management practices have a tendency to increase between-stand diversity by maximizing the amount of edge area and degree of contrast between adjacent stands. Between-stand diversity is therefore highest in landscapes characterized by alternating patterns of forest patches and clearcuts or natural openings compared to a contiguous forest matrix. The increased amount of edge provides habitat for species such as crows, ravens, great horned owls, black bears, and wolves. However, the associated increases in between-stand diversity levels are likely to be at least partially offset by declines in forest interior species due to increases in predator populations along forest edges (Gates and Gysel 1978), or patches of habitat becoming too small to maintain a group of animals or to support a pair's life requisites.

Landscape-level diversity is a function of the spatial distribution of habitat types across a large area (Sidle 1985) such as a Project Area or biogeographic region. An area is expected to support high levels of landscape diversity if viable populations of wildlife and habitat types are well distributed across the region or particular landscape (Sidle 1985, Suring et al. 1992). Timber harvest reduces landscape diversity due to removal of habitat types having high commercial and wildlife value (e.g., low-elevation old growth; high- volume old growth) (Harris 1984, Sidle 1985). Species sensitive to reductions in total habitat area and those that are old-growth dependent are particularly vulnerable to fragmentation (Lynch and Whitcomb 1978, Robbins 1979, Raphael 1984, Harris 1984, Rosenberg and Raphael 1986, Finch 1991). Several MIS and TES of the Tongass National Forest attain their highest population densities in contiguous or high volume old-growth forest, including the hairy woodpecker (Raphael 1984, Suring et al. 1988h), brown creeper (Franzreb and Ohmart 1978, Suring et al. 1988i, McGarigal and McComb unpublished data), bald eagle (Hodges and Robards 1981, Suring et al. 1988f), northern goshawk (Woodbridge 1988, Crocker-Bedford 1990a), and marbled murrelet (Hamer and Cummins 1990, TLMP Draft Revision 1991a). Other species, including Sitka black-tailed deer, marten (Suring et al. 1988c), bald eagle (Suring et al. 1988f), and red-breasted sapsucker (Suring et al. 1988g), are most abundant in low elevation, old-growth forest. Although site-specific information is sparse for Southeast Alaska, current literature suggests that to maintain population viability within an area or biogeographic region, it is necessary to emphasize the integrity of species-rich areas, such as low-elevation (Harris 1984) and high-volume, old-growth forest (Suring et al. 1992).

Habitat Diversity

The amount and diversity of habitats within an area will dictate its final diversity. While old-growth forest habitats are most affected by timber harvest, and are used to evaluate biodiversity within this section, species use a variety of other habitats throughout the year. A description of wildlife habitats and their acreages within the Project Area is presented in Chapter 3 *Wildlife* section (Tables 3-28a and 3-28b).

The amount of contiguous old-growth habitat, its distribution within a land management area, and the extent to which similar habitats connect by corridors, are considered key concepts in maintaining biodiversity (Harris 1984). Because of the importance of unfragmented old-growth forest, and the fact that MIS chosen for this EIS are old-growth associates or obligates, old-growth habitat, its distribution, patch sizes, amount of interior habitat, connectivity, and fragmentation are used to evaluate biodiversity.

Old-growth stands have an uneven appearance because they contain trees of many ages, sizes, and condition, and contain numerous dead tops and snags. Based on past forest inventories, old-growth stands are assumed to have reached an equilibrium where timber growth equals mortality (TLMP Draft Revision 1991a). Tree establishment largely depends on LWD (logs and stumps) (Harmon 1986, Harmon and Franklin 1989) and gap formation (Alaback 1988). Woody debris provides microsites for trees to grow on. Gaps created by windthrow or other disturbance allow light to penetrate to the forest floor. This process of tree death and replacement is continual; in any one year, some trees in individual stands are likely to blow down (Harris 1989). Thus, the forest is a mosaic of older and younger trees, changing yet remaining stable as a forested ecosystem (Borman and Likens 1979, Alaback 1988, Schoen et al. 1988, Franklin 1990).

Old-growth forest is important wildlife habitat for old-growth-associated species such as Sitka black-tailed deer, marten, black bear, Vancouver Canada geese, and cavity- or snag-dependent species such as red-breasted sapsuckers, hairy woodpeckers, and owls. Many species have evolved to use the structural attributes of old-growth forests. The combination of a dense canopy with scattered openings allows forage growth under openings, while the large limbs within the canopy intercept enough snowfall to provide winter food and thermal cover for deer and other species (Kirchoff and Schoen 1987, Hanley and Rose 1987). The large, dense stems also provide some measure of thermal insulation in the winter, as well as during cold rains in the spring and summer. Large dead or defective trees become nesting sites for martens, owls, eagles, wrens, and chickadees, as well as feeding sites for woodpeckers, sapsuckers, and others species.

The value of old-growth forest for wildlife habitat is also thought to transcend individual stands. Large, contiguous, unfragmented blocks of old-growth forest are important to species, such as the northern goshawk and marten. The large old-growth blocks provide preferred hunting habitat (goshawks and marten) protection from predators (marbled murrelet), and promote mixing among individuals that would be less likely to breed if they were spatially separated by forest fragmentation (marten). Deer use these large old-growth blocks for survival during heavy snow winters and appear to be less vulnerable to predation when in large blocks of old-growth forest, than in small patches near roads.

Old-growth forests are a decreasing component of the temperate rain forest ecosystem. They differ in ecological function in many ways from younger, even-aged forests. Old-growth stands typically exhibit a wider variety of reproductive niches for species whose existence is thought to be old growth dependent including animals, understory plants, and microorganisms such as mychorrizae. It appears that these species are most successful when permitted to develop under at least a partially intact mature forest canopy.

Fragmentation and Connectivity

Fragmentation occurs whenever a large continuous habitat is transformed into smaller patches that are isolated from each other by catastrophic windstorms or clearcutting. The changed landscape functions as a barrier to dispersal for species associated with the original habitat. These smaller and more isolated habitats also support smaller populations, which are more

vulnerable to local extinction, thereby causing the smaller, more isolated habitats to contain fewer interior forest species. While research on this topic in Southeast Alaska is minimal, the scientific literature describes many examples where fragmentation of formerly widespread terrestrial habitats into remnants of various sizes and degrees of isolation has resulted in extinction of species from blocks of remaining habitat (Harris 1984, Rosenburg and Raphael 1986, Gutierrez and Carey 1985).

Research shows that forest fragmentation results in an increased ratio of forest edge to forest interior and can have a strong negative effect on forest-interior species. As more edge habitat becomes available as a result of fragmentation, the edge-dwelling species invade the interior environment and become a major threat to the survival of the forest interior-dwelling species. Rosenberg and Raphael (1986) recommended a minimum stand size of 50 acres where delineating old-growth habitat, and suggest that when a stand is greater than 50 percent isolated, the minimum inclusion size increases to 124 acres. By maintaining large contiguous blocks of habitat, the forest interior-dwelling species would realize less competition and predation from open-forest and edge species.

The Polk Inlet Project Area portion of the North Central Prince of Wales province has experienced considerable timber harvest during the past 40 years, totalling over 21,000 acres, while the Project Area portion in the South Prince of Wales province remains relatively unharvested. VCU's 610, 620, 621, 622, and 624 have sustained the largest amount of timber harvest, while VCU's 612, 674, and 675 have had little harvest (Table 3-18). That portion of VCU 674 in the South Prince of Wales province has had minor timber harvest (113 acres in Big Creek) and contains one of the largest blocks of high volume old growth remaining in the Project Area, Sulzer Portage. Sulzer Portage represents the only terrestrial habitat corridor between the two provinces; this land has been withdrawn for a Haida Corporation land exchange and is believed likely to be harvested within the next decade.

Wilcove (1985) reported elevated predation levels for avian nest sites ranging from 984 to 1,968 feet from the forest edge in small woodlots in Maryland. Studies in the Pacific Northwest indicate the influence of edge on vegetation communities extends from 50 to 450 feet into the forest interior (Chen et al. 1992). In addition, the Forest Service (1991b) considered predation levels to extend 328 feet from the forest edge in lodgepole pine (*Pinus contorta*) stands subjected to extensive timber harvest in southwest Montana. Given the sensitivity of murrelets and other species to nest-site predation and the relationship between edge effects and avian nesting success, we assumed that forest patches below 8 acres (radius = 328 feet) are essentially all edge and would therefore have a much higher potential for predation of murrelet nest sites.

The analysis of forest fragmentation in the Project Area was based on the total number of old-growth forest patches and the percentage of area within specific patch size classes. Patch size classes were selected to represent MIS requirements based on the species patch size effectiveness curves and HCA recommendations of the VPOP committee (Table 3-41). Old-growth forest patches were defined as the amount of contiguous old growth of Volume Class 4 and above. Interior forest patches were defined as old growth within an individual forest patch that is a minimum of 328 feet away from the forest edge. Total forest patch size was used to calculate patch size effectiveness because total patch size, not interior patch size, was the basis for previously developed patch size effectiveness curves and HCA recommendations.

Prior to timber harvest (1954), the Project Area contained extensive forest patches that met the criteria of small, medium, and large HCA's (Figure 3-13). In particular, approximately 68 percent of the total old growth throughout the Project Area was in forest patches greater than

10,000 acres (i.e., large HCA's) (Figure 3-14). Timber harvest under existing contracts has resulted in declines in this patch size from 68 percent to 38 percent of the pre-logging levels and the conversion of large patches to smaller patch sizes primarily in the 1,001- to 5,000-acre-size class (Figures 3-15 and 3-16). The majority of interior forest habitat in the Project Area was in the 1,001- to 10,000-acre-size classes prior to timber harvest (1954) (Figure 3-17). No interior habitat greater than 10,000 acres existed in the Project Area even under pre-logging conditions. Past timber harvest has resulted in declines in interior habitat within the 5,001- to 10,000-acre-patch size from 27 percent to 0 percent for existing conditions (Figure 3-18).

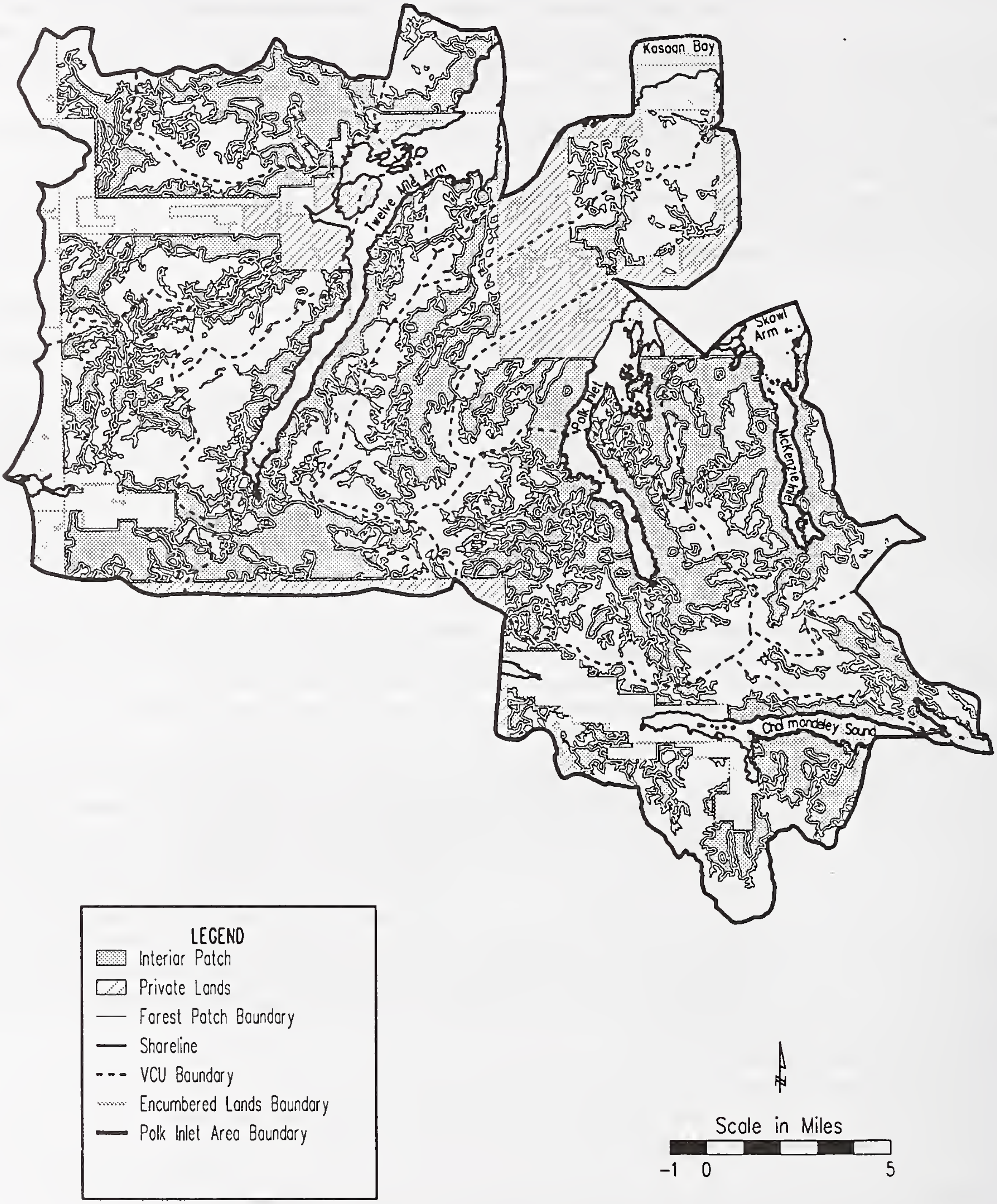
Table 3-41
Patch Size Class Relationships

Patch Size (acres)	Species Relationship
0-25	Incorporates optimal patch size for occurrence of brown creeper (15 acres).
26-100	Arbitrary, based on the distribution of the data.
101-500	Incorporates optimal patch size for occurrence of marten (180 acres), sapsuckers (250 acres), and occurrence of hairy woodpecker (500 acres).
501-1,000	Small HCA's, incorporates optimal patch size for productivity of deer (1,000 acres).
1,001-5,000	Arbitrary, can also function as small HCA's.
5,001-10,000	Medium HCA's.
>10,000	Large HCA's.

SOURCE: Workshop to recommend patch size relationship and corridor requirements for the MIS and TES species.

Fragmentation of existing old growth results in a reduction in the effectiveness of remaining patches as wildlife habitat. Individual species respond to natural and human- induced fragmentation differently, species like brown creepers and hairy woodpeckers can be supported by smaller patches of forest habitat than species such as deer and marten (Proceedings of workshop to recommend patch size relationships and corridor requirements for the MIS and TES species) (Table 3-42). Patch-size effectiveness percentages for 1954 range from 99.7 percent (brown creepers) to 95.6 percent for deer (Table 3-43). The values for 1995 vary from 99.4 percent effective to 90.2 percent effective. The greatest difference in percent effectiveness between 1954 and 1995 was for deer, which showed a 5.4 percent reduction in patch size effectiveness.

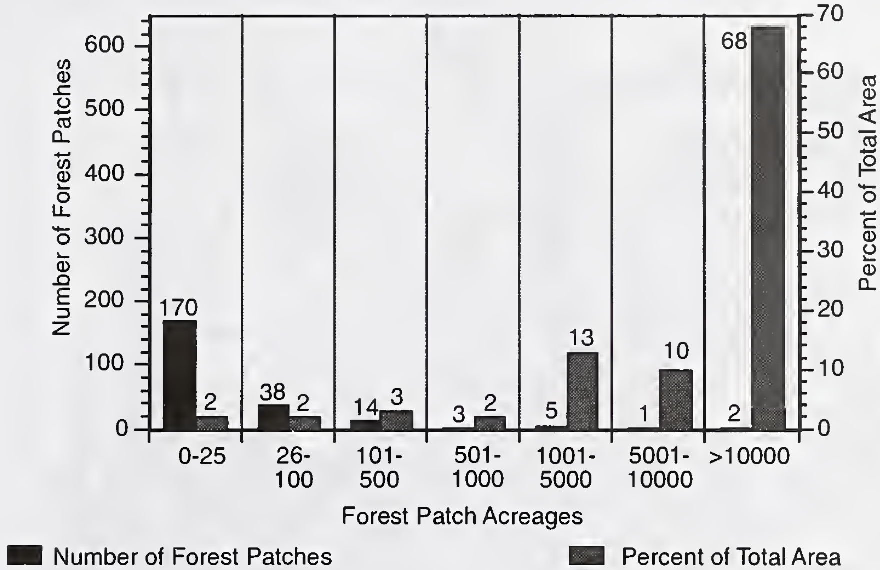
Figure 3-13
Distribution of Forest and Interior Patches in 1954



SOURCE: Forest Service, Ketchikan Area, database.

Figure 3-14

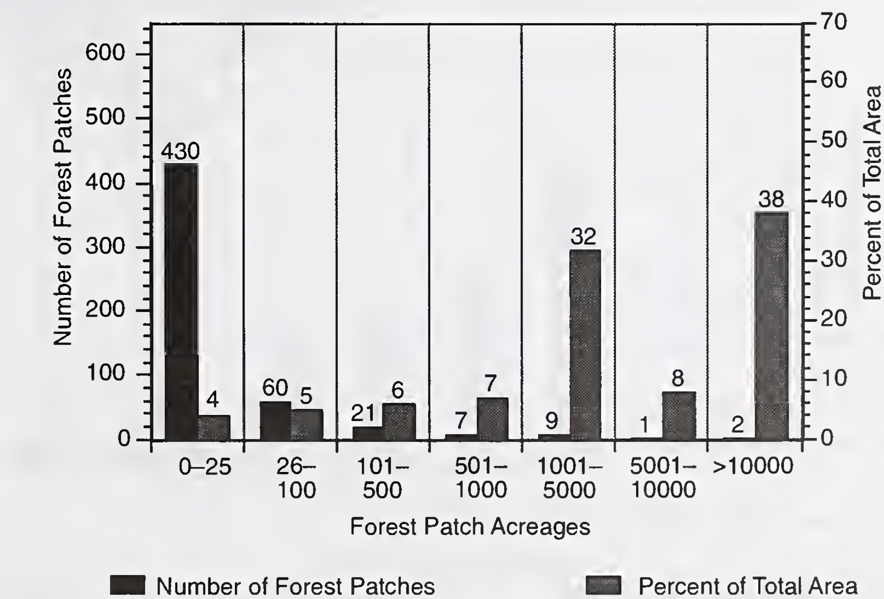
Number of Forest Patches and Percent of Total Project Forest Area Under Pre-logging Conditions (1954)



SOURCE: Forest Service, Ketchikan Area, database.

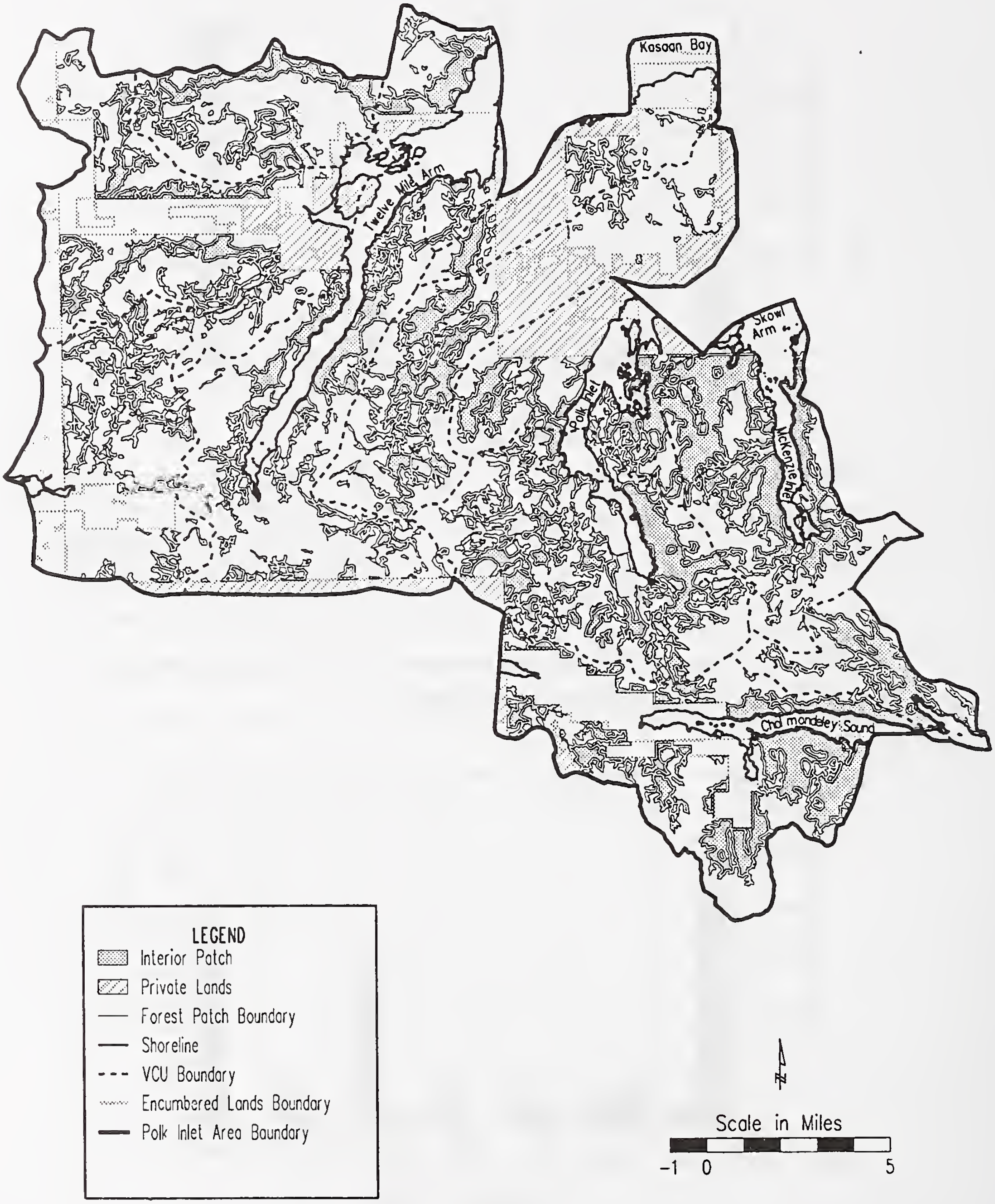
Figure 3-15

Number of Forest Patches and Percent of Total Project Forest Area Under Existing Conditions (1995)



SOURCE: Forest Service, Ketchikan Area, database.

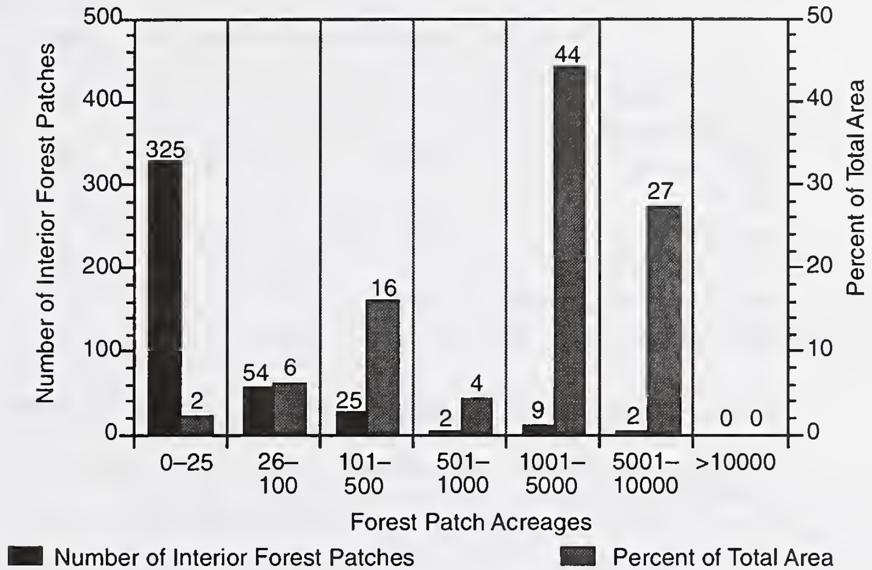
Figure 3-16
Distribution of Forest and Interior Patches Under Existing Conditions (1995)



SOURCE: Forest Service, Ketchikan Area, database.

Figure 3-17

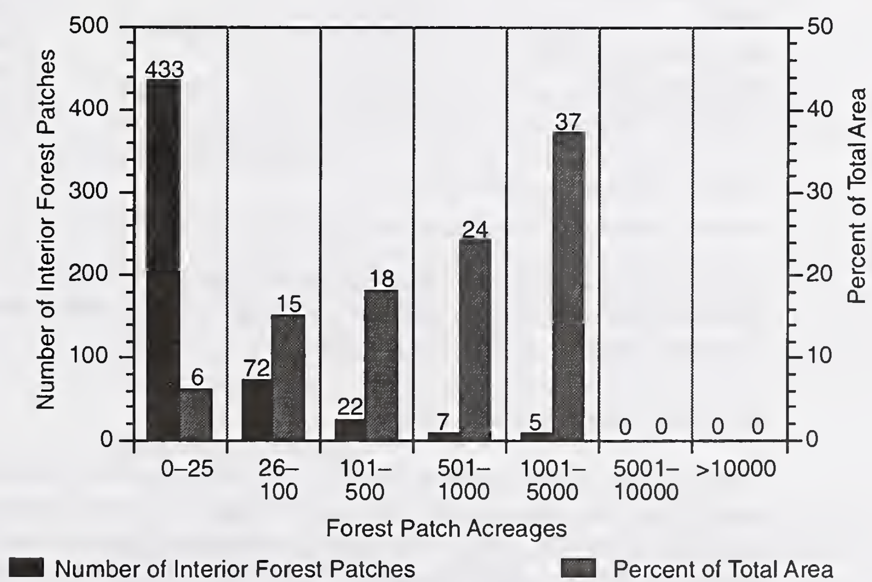
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Pre-logging Conditions (1954)



SOURCE: Forest Service, Ketchikan Area, database.

Figure 3-18

Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Existing Conditions (1995)



SOURCE: Forest Service, Ketchikan Area, database.

Table 3-42
Patch Size Effectiveness Curve Values by Patch Size Class and by Species

	Patch Size Classes (Acres)						
	0-25	25-100	100-500	500-1,000	1,000-5,000	5,000-10,000	>10,000
Sitka black-tailed deer[1/]	0.3	0.35	0.5	0.83	1.0	1.0	1.0
Marten[1/]	0.2	0.5	0.9	1.0	1.0	1.0	1.0
Red-breasted sapsucker[1]	0.2	0.58	0.9	1.0	1.0	1.0	1.0
Hairy woodpecker[1]	0.1	0.42	0.65	1.0	1.0	1.0	1.0
Brown creeper[1/]	0.8	1.0	1.0	1.0	1.0	1.0	1.0

SOURCE: Workshop to recommend patch size relationships and corridor requirements for the MIS and TES species, July 31 to August 1, 1989, Juneau, Alaska.

1/ Represents the median curve value within each patch size class from the species effectiveness curves.

Table 3-43
Patch Size Effectiveness Values for Five Management Indicator Species

Species	1954	1995
Sitka black-tailed deer	0.956	0.902
Marten	0.974	0.943
Red-breasted sapsucker	0.975	0.946
Hairy woodpecker	0.963	0.920
Brown creeper	0.997	0.994

SOURCE: MIS habitat capability models.

On National Forest System lands within and adjacent to the Project Area, are large, relatively unfragmented blocks of old-growth forest considered as important wildlife habitats. These blocks are described in the following sections.

Big Creek/Cannery Creek Block

This is the largest block south of the West Arm of Cholmondeley Sound and Sulzer Portage in the Project Area and contains much high-volume old growth that largely occurs in Modified Landscape LUD. This block is important for maintaining connectivity with areas to the south of the Project Area in the South Prince of Wales Ecological Province especially because of past and probable future harvest on Native Corporation lands in this area.

Sunny Creek/North Shore Cholmondeley Sound Block

There has been no previous harvest in this block, which primarily consists of Modified Landscape LUD. This block includes a substantial amount of previously designated retention and is important for maintaining connectivity between the Big Creek/Cannery Creek block, areas to the north, and areas to the east outside the Project Area.

Old Tom/McKenzie/Goose Bay Block

This large contiguous block of old growth includes the Old Tom Creek RNA, much of the west side of McKenzie Inlet, and areas between Old Tom Creek RNA and Goose Bay/Polk Inlet. It is mostly unharvested, but contains harvest areas from the 1989-94 EIS.

Polk Inlet/Dog Salmon Block

This small block generally includes the Dog Salmon Creek watershed and extends from Polk Inlet. It is in an area of extensive past harvest and enhances connectivity of the Project Area with areas to the south.

East Shore Twelvemile/Old Franks Block

This large block has received little previous harvest. It includes a substantial amount of previously designated retention and essentially consists of one large block with West Shore Twelvemile/Indian Creek Block, which is just across Twelvemile Arm.

West Shore Twelvemile/Indian Creek Block

This block is large but contains a high degree of natural and harvest-related fragmentation. It includes an unharvested block of State land at the mouth of Indian Creek and also contains much previously designated retention and includes a large amount of Modified Landscape LUD. This block is important for connecting areas east of Twelvemile Arm with areas to north and areas to the west.

Twelvemile/Trocadero Block/Corridor

This block contains extensive harvest and natural fragmentation, but is important for maintaining connectivity between areas west of the Project Area and the West Shore Twelvemile/Indian Creek block.

It is recognized that maintaining appropriate habitat corridors or connections between blocks of old-growth forest habitat may be important to minimize isolation and gradual decline of wildlife species associated with the old-growth blocks (Harris 1984, Hunter 1990). At a minimum, interconnectivity among all blocks in the Polk Inlet Project Area is provided by smaller individual stands of old growth. Corridors of old growth that are important for maintaining the interconnectivity between these blocks are described in the following sections.

Omar Creek Corridor

This corridor is important for connecting the Sunny Creek/North Shore Cholmondeley Sound Block with the Old Tom/McKenzie/Goose Bay block. This corridor may have considerable fragmentation from the 1989-94 EIS.

Polk Inlet/Cabin Creek Corridor

This corridor contains considerable harvest, but is important for maintaining connectivity between the west shore of Polk Inlet and areas to the east of Polk Inlet with the East Shore Twelvemile/Old Franks Block.

Rock Creek Corridor

This corridor is important for connectivity between the Polk Inlet area and the Cholmondeley Sound Area. It crosses the lowest pass between these two areas.

Dog Salmon/Sulzer Portage Corridor

This corridor connects the Polk Inlet/Dog Salmon Block with the Sulzer Portage and the North Shore Cholmondeley area.

Dog Salmon/Twelvemile Corridor

This corridor connects the Polk Inlet/Dog Salmon Block with the West Shore Twelvemile Block. It has undergone extensive past harvest and follows an existing major forest road, but follows the low elevations including the valleys of Twelvemile and Beaver Creeks.

Twelvemile/Trocadero Block/Corridor

This corridor is listed above under old-growth blocks.

One Duck/Twentymile Corridor

This corridor contains considerable harvest and natural fragmentation, but is important for maintaining connectivity between areas north of the Project Area (Karta Wilderness) and the West Shore Twelvemile/Indian Creek block. It includes a large amount of Modified Landscape LUD.

Harris River Corridor

This corridor contains extensive past harvest, but is an important east-west corridor for maintaining connectivity across the Island. The value is somewhat limited by the presence of a major transportation route (the Hollis-Klawock Highway).

Wolf Lake/Hollis/Indian Creek Corridor

This corridor includes considerable old growth north of Hollis and around Indian Creek mouth and is fragmented in-between. Part of this corridor is in a Scenic Viewshed LUD. This corridor helps maintain connectivity between the Karta Wilderness and the West Shore Twelvemile/Indian Creek Block. Opportunities for second-growth management within the corridor are in lower Maybeso Experimental Forest.

The connectivity, or corridors, between habitat patches in a landscape may be at least as significant to maintaining diversity as the size of the patches (Noss 1983). Forman and Gordon (1981) defined corridors as being of four types; (1) line corridors—those which are all edge and possess no interior habitat, (2) strip corridors—those which maintain interior habitat, (3) stream corridors—those bordering a water source, and (4) network corridors—those which intersect and form patterns. Corridors can function as more than one type; for example, when a stream corridor is wide enough to incorporate interior habitat it also functions as a strip corridor. Their work also highlighted the fact that some interior species will not live in or even migrate through extensive lengths of unsuitable habitat, and that strip corridors were preferable to line corridors. Management of corridors as well as habitat patches should strive to mimic natural patterns; yet there are few instances where connectivity has been recognized to the point of implementation in land-use plans (Noss and Harris 1986).

Population Distribution

National Forest System lands must be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area (National Forest Management Act [NFMA] 1976). For planning purposes, a viable population is one which has the estimated numbers and distribution of reproductive individuals needed to ensure its continued existence, well distributed in the planning area. To ensure that viable populations would be maintained, habitat is being provided to support and sustain at least a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals could interact with others in the planning area.

The task of maintaining habitats to support biodiversity has encompassed several methodologies, and alternatives continue to evolve. Prior to the TLMP Draft Revision, the Ketchikan Area identified old-growth habitat areas (for retention and extended rotation) for wildlife and visual concerns. The TLMP Draft Revision (1991a) refocused its biodiversity and population viability management strategies in ecological planning areas, and took a broader regional view. Recent efforts to further refine the process of biodiversity and population viability management led to the convening of an interagency committee on the subject. A brief description of each is presented below.

Over 24,000 acres of old-growth areas identified in the Project Area for retention and extended rotation were mapped in the 1989-94 Long-term Sale EIS (Forest Service 1989b). More than 4,000 of these original acres are now in other ownership including lands currently encumbered. These previously mapped old-growth areas were selected to benefit wildlife by maintaining large blocks of unfragmented habitat and to serve visual management and other resource needs. They were in the greatest abundance along Twelvemile Arm, the Old Franks Watershed, Polk Inlet, McKenzie Inlet, and Cholmondeley Sound (Figure 3-19). Harvest in extended rotation areas by the end of the 1989-94 Operating Period would reduce the acreage of standing old growth by about 2,000 acres, leaving about 18,000 acres remaining (Table 3-44).

McKenzie Inlet

Table 3-44

Current Status of Previously Mapped Old Growth (retention and extended rotation) in the Project Area[1/]

VCU	Total Acres	1994 Unharvested Acres[2/]
610	0	0
611	385	385
612	306	306
613	1,314	1,244
618	3,286	2,951
619	1,720	1,259
620	3,655	3,025
621	4,362	4,058
622	1,306	1,221
624	743	643
674	2,240	2,240
675	897	897
Total	20,214	18,229

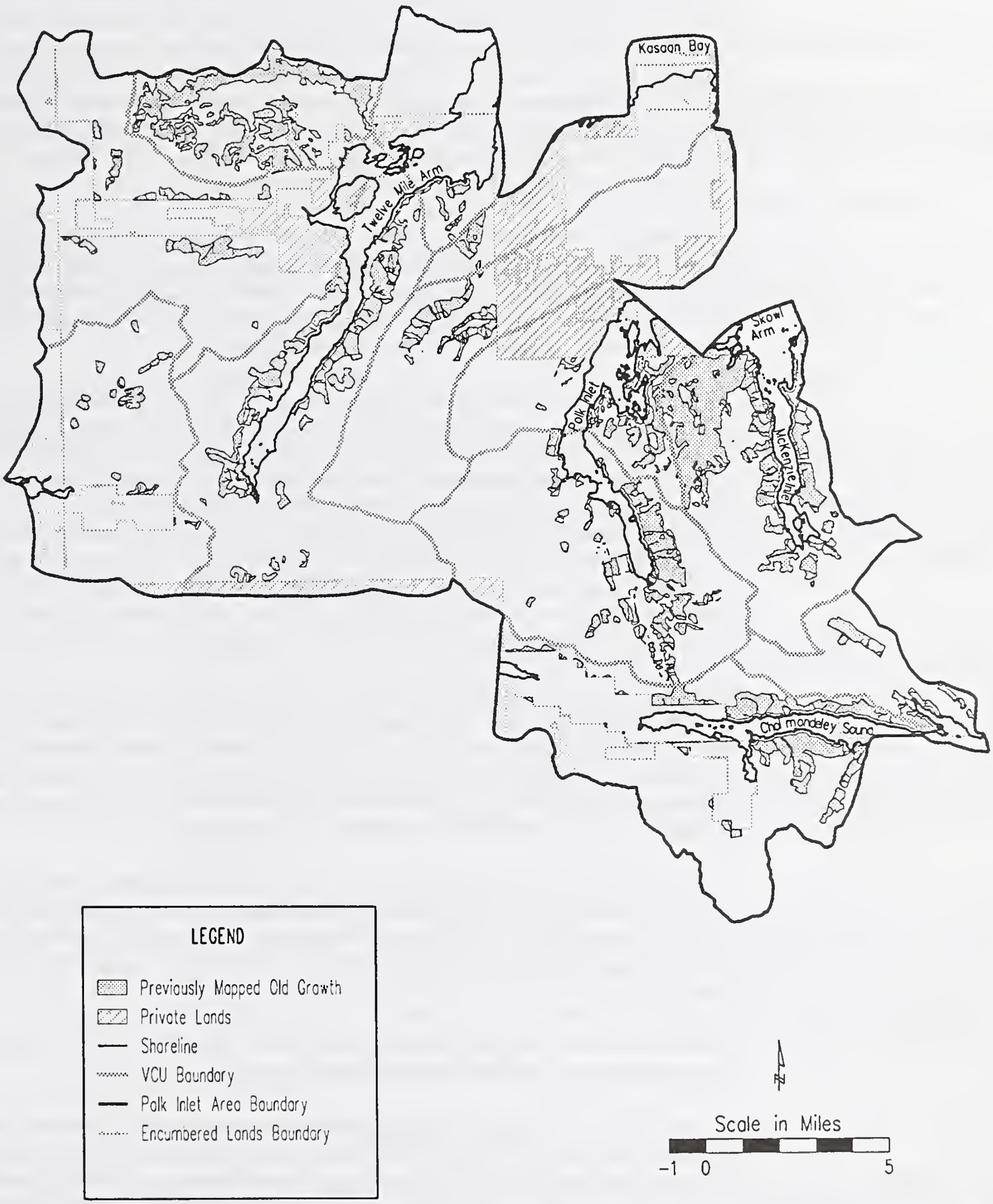
SOURCE: Forest Service, Ketchikan Area, database.

1/ Only areas on nonencumbered National Forest System land are included. An additional 4,275 acres of previously mapped old-growth areas are currently in other ownership, including encumbered lands.

2/ Acres harvested are in extended rotation areas after full implementation of the 1989-94 EIS (Forest Service 1989).

Figure 3-19

Current Distribution of Previously Mapped Old Growth (Retention and Extended Rotation) and Old Growth Remaining in Maybeso Experimental Forest and Old Tom Creek Research Natural Area



SOURCE: Forest Service, Ketchikan Area, database.

The TLMP Draft Revision (1991a) provides for regional management and maintenance of population viability at the planning area level. An "analysis area" for defining viable populations is the ecological province (TLMP 1991a). The Polk Inlet Project Area intersects two ecological provinces: North Central and South Prince of Wales (TLMP 1991a) (Figure 3-12). The two provinces are separated by Cholmondeley Sound, with the majority of the Project Area located in the southern end of the North Central Prince of Wales Island province (14), and a small portion located on the northern tip of the South Prince.of Wales Island province (18). Under TLMP, project areas are not expected to independently maintain viable populations, but to contribute to and not cause a decline of overall viable populations for the province. Standards and guidelines outline prescriptions for maintaining biodiversity at the project area level (TLMP Draft Revision 1991a). A more detailed discussion of managing biological diversity can be found in the TLMP Draft Revision, 1991, Volume 149, Chapter 3 pages 9 through 45 and is incorporated here by reference.

An interagency committee appointed by the Forest Service was assembled (Viable Population Committee [VPOP]) to develop special standards and guidelines for some species associated with old-growth forests to ensure that their populations remain viable and well distributed across their current range on the Tongass National Forest (internal Forest Service memo, August 22, 1992, J. Capp Chair Viability Steering Committee).

The VPOP committee focused on viability risk assessments that could be applied to the evaluation of planning alternatives (internal Forest Service memo, August 22, 1992, J. Capp Chair Viability Steering Committee) over large areas known as habitat conservation areas (HCA's). The VPOP committee recommended HCA's of three sizes: large, medium, and small (Suring et al. 1992). The three different HCA's could be applied to individual planning areas or to multiple planning areas provided sufficient connecting corridors are present to permit dispersal of wildlife across HCA's. Suring et al. (1991) identified 13 HCA's in the North Central and South Prince of Wales ecological provinces. Of these 13 habitat conservation areas, 5 intersect or are adjacent to the Polk Inlet Project Area; Karta HCA, Trocadero Split HCA, Old Franks HCA, Old Tom HCA, and South Prince of Wales core reserve.

For a large HCA, a tract should include at least 20,000 acres of old growth with over 8 MBF per acre, including at least 10,000 acres with over 20 MBF per acre within a total area of at least 40,000 acres (Suring et al. 1992). Large HCA's should be no more than 20 miles apart, edge to edge, to ensure effective dispersal between them. HCA's with these characteristics are believed to be necessary to ensure that viable populations of wide-ranging species such as goshawk and marten are well distributed within a planning area.

A medium HCA would encompass at least 5,000 acres of old-growth forest with over 8 MBF per acre, including at least 2,500 acres of old-growth forest with over 20 MBF per acre within an area of at least 10,000 acres. Medium HCA's would be capable of supporting at least 5 female martens during winters of poor prey and 2 pairs of goshawks (Suring et al. 1992).

Various medium and large HCA strategies have been mapped since 1991. Various strategies continue to be studied in the Forest Plan revision process.

Small HCA's would encompass at least 800 acres of old-growth forest having over 8 MBF per acre within an area of at least 1,600 acres. Small HCA's would be capable of supporting at least 1 female marten during winters of poor prey (Suring et al. 1992). Small HCA's are maintained to provide temporary functional habitat for wildlife dispersing between large and medium HCA's. The small HCA's also contribute to the landscape matrix between large and medium HCA's.

Lands

Key Terms

Alaska Native Claims Settlement Act (ANCSA)—provides for the settlement of certain land claims of Alaska Natives.
Encumbrance—a claim, lien, charge, or liability attached to and binding real property.
Native selection—application by Native corporations to the USDI Bureau of Land Management for conveyance of a portion of lands withdrawn under ANCSA in fulfillment of Native entitlements established under ANCSA.
Special use permits—permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.
State selection—application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska, under the Alaska Statehood Act.

Introduction

Prior to 1971, the Ketchikan Area land base of the Tongass National Forest was fairly stable. Only minor changes took place, such as the transfer of National Forest System lands to private homesites, canneries, and townsites. Beginning in the early 1970's, however, significant land ownership changes were made as a result of major legislation, including the Alaska Native Claims Settlement Act of 1971 (ANCSA) and the Alaska National Interest Lands Conservation Act of 1980 (ANILCA).

The majority of the land in the Project Area is Federal land managed by the Forest Service as part of the Tongass National Forest. Timber management is the primary National Forest use within the Project Area. Although the Forest Service administers over 90 percent of the land within the Project Area, there are significant amounts of land owned by other entities (Figures 3-20 and 3-21). Almost 10 percent of the land base is in State, Native corporation, or private ownership. The State of Alaska owns or has selected approximately 7 percent of the land in the Project Area. State-owned or selected land is located primarily near Hollis, adjacent to the Harris River, and east of Trocadero Bay along Cable Creek and is used for a variety of purposes.

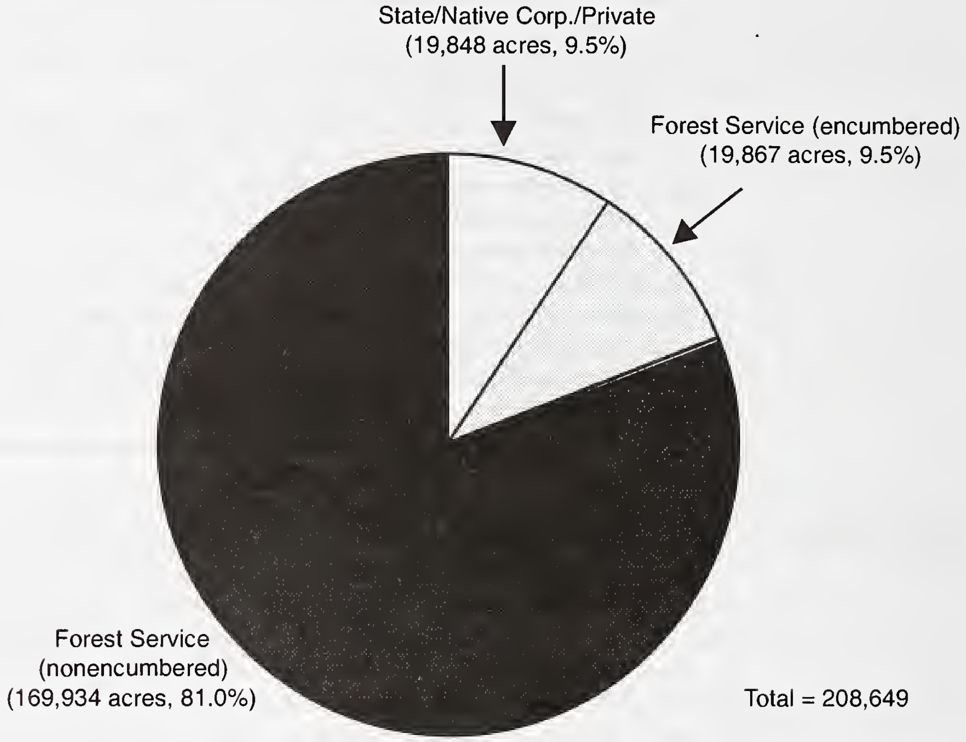
The Sealaska Corporation is the third largest land owner in the Project Area, owning approximately 5 percent of the land. Current land use on Sealaska land is primarily timber production. Other groups that own or have claims to large parcels of land include the Kavilco Village Corporation, which has selected less than 2 percent of the land in the Project Area. In addition, there is an undetermined amount of land owned by private individuals that constitutes less than one percent of the land in the Project Area. Most of the private land is located near Hollis and Sunny Cove and is residential in use.

State and Native Lands, Claims and Allotments

The Alaska Statehood Act of 1959 authorized the State of Alaska to select 400,000 acres of National Forest System lands in Alaska. To date, approximately 57 percent of the State's entitlement has been conveyed. Most of the remaining land has been selected and is in the

Figure 3-20

Land Ownership/Administration in the Project Area



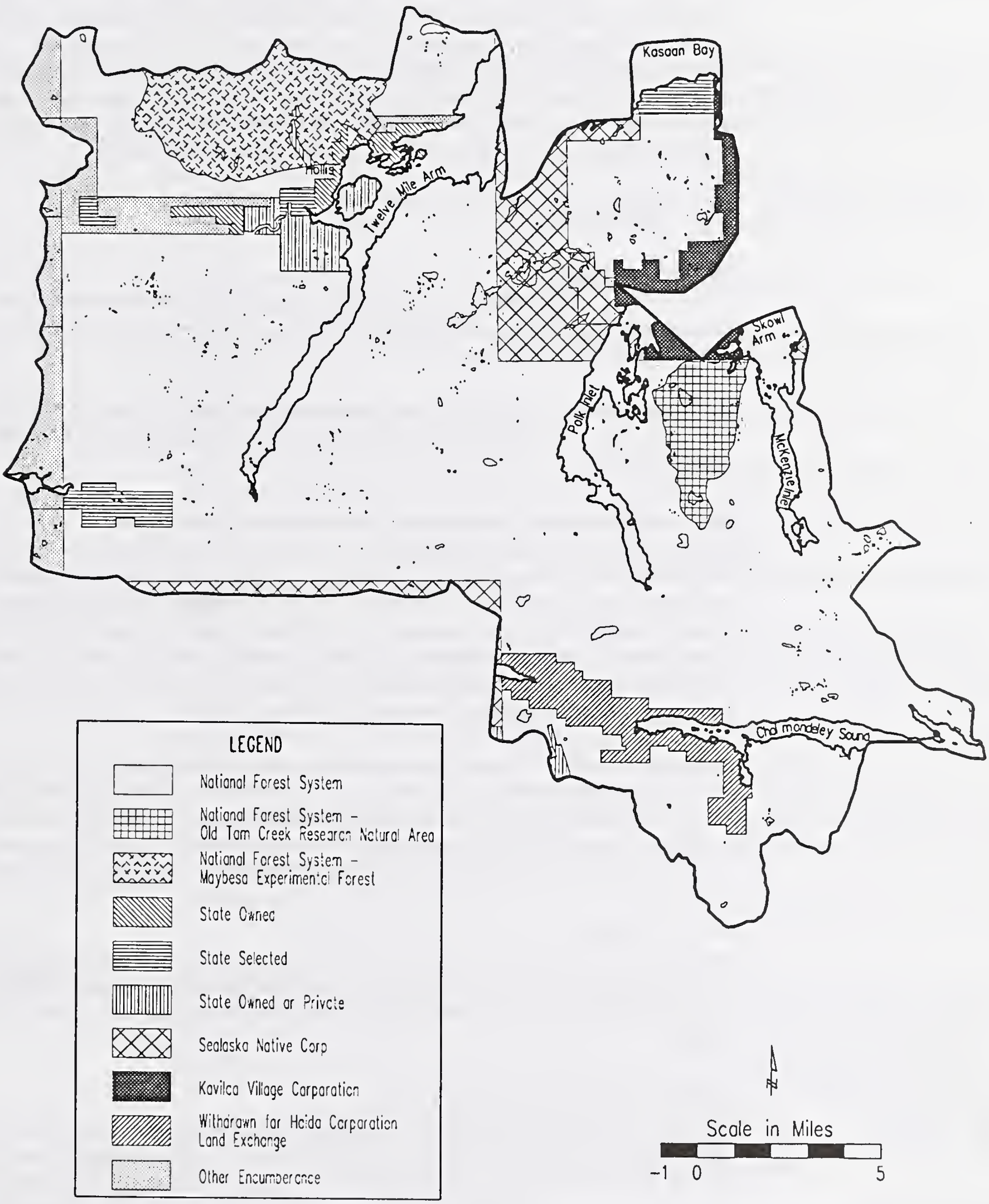
SOURCE: Forest Service, Ketchikan Area, database.

process of being conveyed by the Bureau of Land Management. ANILCA provides that the State has until 1994 to complete its selections and may select lands in excess of its remaining entitlement. Because the State of Alaska was granted the opportunity to select more lands than it was entitled to receive by conveyance, some of these lands might become available for National Forest harvest in the future.

The State owns lands in the vicinity of Hollis and along the Harris River. Along the river, 410 acres have been conveyed and are currently being used for private resident lots and undeveloped recreation. Additional State selections of land along the Harris River have been made, but have not yet been conveyed.

ANCSA provides for conveyance of certain lands to the ten Native village corporations, the two Native urban corporations, and the one Native regional corporation located in Southeast Alaska. These corporations were entitled to select approximately 550,000 acres of land from the Tongass National Forest. About 90 percent of these lands have been conveyed to the corporations. The U.S. Department of Interior, Bureau of Land Management, issued regulations authorizing these corporations to select lands in excess of their entitlement. However, as with State selections, only the actual entitlement will be conveyed.

Figure 3-21
Land Ownership Status in the Project Area



SOURCE: Forest Service, Ketchikan Area, database.

Two areas have been withdrawn by Native corporations within the Project Area. The larger of the two is a Haida Corporation withdrawal of approximately 5,600 acres. It is part of a land exchange, encompassing the mouth and west side of the Big Creek estuary and drainage, and extending along the west side of the West Arm of Cholmondeley Sound through Sulzer Portage to Hetta Inlet. The smaller withdrawal was by the Kootznoowoo Corporation; the northern tip of this withdrawal consists of approximately 300 acres in VCU 674. Although the lands have not yet been selected, they are encumbered by the withdrawals. Timber harvest can take place, but the Native corporation must be notified and the receipts put into an escrow account. Because Native corporations were granted the opportunity to select more lands than they were entitled to receive by conveyance, some of these lands might again become available for management by the Forest Service in the future.

Other Land Uses

Residential Lands

There are three concentrated areas of privately owned land within the Project Area. The largest is the community of Hollis, in which approximately 410 acres are privately owned. Most of the private land in Hollis is residential.

In addition to Hollis, there are parcels of privately owned lands in Sunny Cove (VCU 675) and near Cannery Creek. Several of the parcels have structures that are used as residences or second homes.

Timber Management on Non-National Forest System Lands

National Forest Service lands within and near the Project Area have been conveyed to both the Sealaska Native Corporation and the Kavilco Village Corporation. In addition, land has been withdrawn for selection in the Sulzer Portage area as part of a land exchange with the Haida Corporation. Much of the timber on Sealaska Corporation and Kavilco Corporation lands has been harvested. If the rate of recent harvest activities continues, it could be assumed that most of the remaining timber on Native Corporation-owned and selected lands would be harvested in the near future.

The Haida Corporation currently does not plan to harvest timber on land near Sulzer Portage if, and when, the land is conveyed to them as part of the Haida Corporation land exchange (personal communication, B. Cook, President, Haida Corporation, Hydaburg, Alaska, February 2, 1993). However, if past harvest activities are any indication, it can be assumed that at some point the timber in Sulzer Portage would be harvested if the land exchange is completed.

Mining Claims

There are nine claim groups that have a total of approximately 300 individual mining claims in and near the Project Area. The nine claim groups and the general locations of the claims in and near the Project Area are described in the *Geology, Minerals, and Caves* section of this Chapter.

Forest Service Special Use Permits

The Forest Service has issued several special use permits (SUP) in the Project Area (letter, J. Weyhmiller, Resource Assistant, Craig Ranger District, Tongass National Forest, Craig Alaska, June 19, 1992). In Polk Inlet, there are two SUP's, one for a logging camp and the other for barge tie-ups. Several SUP's have been issued close to but outside of the Project Area. They include SUP's for a hydroelectric facility and a cabin near Paul Bight (adjacent to the northern edge of Old Tom Creek Research Natural Area). A SUP has also been issued for a fish-counting weir at Big Creek.

Transportation and Facilities

Key Terms

A-frame LTF—log transfer facility system which consists of a stationary mast with a falling boom for lifting logs from trucks to water. This system is generally located on a shot rock embankment with a vertical bulkhead to access deep water, accommodating operations at all tidal periods.
Access management—the designation of roads for differing levels of use by the public.
Aquatic Habitat Management Unit (AHMU)—a mapping unit that displays an identified value for aquatic resources; a mechanism for carrying out aquatic resource management policy.
Arterial roads—roads usually developed and operated for long-term land and resource management purposes and constant service.
Endless chain LTF—log transfer facility system which consists of a gravity slide ramp for sliding log bundles into the water, with a chain assist system to slow the velocity of logs entering the water.
Collector roads—roads that collect traffic from Forest Local roads; usually connect to a Forest Arterial road or public highway.
Local roads—roads that provide access for a specific resource use activity such as a timber sale or recreational site; other minor uses may be served.
Log Transfer Facility (LTF)—a facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft.
Main trunk roads—primary roads that are used repeatedly for forest access over long period of time.
Maintenance levels—levels at which roads are maintained (or closed) for various uses, including high-clearance vehicle and passenger vehicle use. See Glossary for more detail.
Modular bridge—a portable bridge constructed of components that can be readily assembled and disassembled for movement from one site to another.
Specified roads—a road, including related transportation facilities and appurtenances, shown on the Sale Area Map and listed in the Timber Sale Contract. These roads are constructed as permanent roads as part of the forest development transportation system.
Temporary roads—short term roads built for limited resource activity or other project needs.
Traffic service levels—traffic characteristics and operating conditions that are used in setting road maintenance levels.

Transportation

Access to Prince of Wales Island and the Polk Inlet Project Area is by small plane, ferry, and boat. A ferry terminal for the State of Alaska Marine Highway System is located at Hollis which is within the Project Area. The road network on Prince of Wales Island originally developed as a result of timber harvest starting in the mid-1950's. The part of the Hollis-Klawock Highway from the Hollis ferry terminal west to Klawock and Craig is paved and is now part of the State of Alaska Highway System. An upgraded gravel road, also part of the State Highway System, extends south to Hydaburg from the Hollis-Klawock Highway. The Hydaburg Road is just inside the Project Area on its western boundary.

Access into the Maybeso drainage and parts of the Harris River are via older forest roads that branch off the Hollis-Klawock Highway. Currently, these roads are mostly impassable

primarily because they are overgrown with alder. New roads into the Indian River drainage are under design as part of the 1989-94 EIS. The main existing road access into the Project Area is via the Polk Inlet road (Forest Road 21) off the Hydaburg Road. The Polk Inlet road extends east to lower Twelvemile Arm and continues east to Polk Inlet. Several roads branch off of this segment extending partway up the east side of Twelvemile Arm, and along the western and eastern sides of Polk Inlet. A road system also extends into the Cable Creek drainage off the Hydaburg Road.

Currently, timber harvested from National Forest System lands on the north or western part of the Project Area is hauled to lower Twelvemile Arm. This "logshed" would include timber from the Twentymile valley, Harris River area, Indian Creek, the Hydaburg Road, Cable Creek, Old Franks Creek, and the Twelvemile Arm area. Timber harvested east of Old Franks Creek is transported to Polk Inlet. Opportunities to use private road systems that touch the Project Area exist through a user fee agreement. Specifically, the Native corporation facilities at Kina Cove, Smith Cove, and Cabin Creek could provide saltwater access from both Old Franks Creek and the Coal Bay areas.

The Forest Transportation System includes three types of roads: arterials, collectors, and locals. Arterial and some collector roads are usually maintained for use by passenger vehicles and are normally designed for higher truck speeds than local roads. The Polk Inlet road is considered an arterial while the main branches from it are collectors. Local roads provide access to individual harvest units and recreation sites. The Polk Inlet road is designed primarily as a logging road and not for mixed traffic. Though there is frequent public use of the road, the lack of turnouts and off-road parking for recreational access and reduced sight distances from roadside alder growth necessitates user caution.

Table 3-45 shows the total miles of road and road density by VCU for the Project Area. Road density is calculated by dividing the miles of road by the total area in square miles of the VCU. There are 238.5 miles of road within the Project Area either existing or under construction or planned under the 1989-94 EIS. Road density varies from 0 to 1.51 miles of road per square mile of area. No roads exist near McKenzie Inlet, Coal Bay, Sunny Creek, or Cannery Creek, or along Cholmondeley Sound. Roads are planned in McKenzie Inlet and Coal Bay after implementation of the 1989-94 EIS. The 1989-94 EIS is now being implemented in the Polk Inlet Project Area. Upon completion, there will be 97.1 miles of road constructed (Table 3-46).

Post-harvest Maintenance and Access Management

Maintenance levels are based on anticipated road use. The maintenance levels also incorporate traffic service levels and access management. Traffic service levels are displayed in Appendix C. Applicable maintenance levels for the Project Area are:

- Maintenance Level 1 (Traffic Service Level D)—Roads are closed by bridge removal or organic encroachment and are monitored for resource protection. Basic custodial maintenance is performed to perpetuate the road and to facilitate future management activities.

- Maintenance Level 2 (Traffic Service Level C)—Roads are maintained for high-clearance vehicles and monitored for resource protection. Traffic is normally minor, usually consisting of administrative or recreational uses.

- Maintenance Level 3 (Traffic Service Level B)—Roads are maintained for travel by a prudent driver in a standard passenger vehicle and are subject to the provisions of the Highway Safety Act. Road use is by administrative and passenger vehicles, and logging trucks.

Table 3-45
Existing and Planned 1989-94 Operating Period Roads and Road Density for the Polk Inlet Project Area

VCU	Existing Roads (Miles) Arterial	Collector	Local	Total	Road Density (mi/mi²)
610	0.4	1.3	13.3	15.0	0.8
611	0.0	1.0	1.8	2.8	0.2
612	0.0	0.0	7.8	7.8	0.5
613	3.9	4.7	7.1	15.8	0.4
618	0.0	0.0	13.4	13.4	0.5
619	2.1	3.6	9.0	14.6	0.8
620	14.6	14.1	19.7	48.4	1.3
621	10.3	7.5	20.4	38.1	1.0
622	5.2	14.4	16.9	36.6	0.8
624	9.2	0.3	36.5	45.9	1.5
674	0.0	0.0	0.0	0.0	0.0
675	0.0	0.0	0.0	0.0	0.0
Total	45.7	47.0	145.8	238.4	

SOURCE: Forest Service, Ketchikan Area, database.

Table 3-46
Road Construction for the 1989-94 Operating Period for the Ketchikan Pulp Company Long-term Sale

VCU	Road Classification (miles) Arterial	Collector	Local	Total
611	0.0	0.0	0.0	0.0
612	0.0	0.6	4.2	4.8
613	0.0	7.7	8.0	15.7
620	0.0	0.0	13.4	13.4
621	0.0	4.2	8.6	12.8
622	2.3	3.9	12.1	18.3
624	0.0	2.0	5.7	7.7
618	0.0	0.0	11.2	11.2
619	0.0	0.7	9.9	10.6
674	0.0	0.0	0.0	0.0
675	0.0	0.0	2.6	2.6
Total	2.3	19.1	75.7	97.1

SOURCE: Forest Service 1989b.

Access Management Option B as presented in the 1989-94 EIS (Forest Service 1989) represents the current Access Management Plan for the Polk Inlet Project Area. Post-harvest access management of forest roads are utilized where necessary to control any class or type of traffic. Use is managed to prevent damage to the roadway, and to meet management direction for wildlife and recreational objectives. The following categories apply:

- Encourage—Motor vehicle use is encouraged by appropriate signing, public notification, and active maintenance of the road prism.

- Accept—Motor vehicle use is allowed but not encouraged, while the road is maintained for administrative access.

- Discourage—Motor vehicle use is discouraged by allowing alder growth at road entrance, nonremoval of blowdown, or road prism deterioration within acceptable environmental limits (depending on designated maintenance level). To discourage use, the road may also be signed as "Not Maintained for Motor Vehicle Traffic."

- Eliminate—Motor vehicle use is eliminated by physically blocking the road. Where prescribed for long-term intermittent roads, this strategy is achieved by placement of impassable barricades at road entrances. On short-term roads, removal of drainage structures effectively blocks vehicle traffic.

- Prohibit—Motor vehicle use is prohibited by a road order (i.e., CFR closure). Implementation of this strategy on remote road systems may require the installation of gates, in addition to public notification and appropriate signing.

- Prohibit Seasonally—Road is closed to motor vehicle use at times during the normal operating year. For all alternatives, seasonal prohibitions will be used as necessary to mitigate impacts to wildlife and subsistence resources (e.g., closure during either-sex deer hunting season). Administrative and permitted use of the roads will continue during closure periods, but only for specific permitted uses. Seasonal closures may be used in combination with cooperative efforts with fish and game protective agencies.

Logging Camps

A floating logging camp is located at the head of Polk Inlet with an approximate population of 75 people. Personnel from this camp are actively harvesting within the Project Area. During implementation of the 1989-94 EIS, logging camps could be located at Cabin Creek on Polk Inlet, to the east of Little Goose Bay in Skowl Arm, at near Little Coal Bay, or at Daisy Island in Skowl Arm. Five other logging camps nearby are associated with timber harvest on Native land. The Natzuhini camp is located on the west side of the Project Area along Hydaburg Road. This camp provides housing for about 60 people. There is also a camp at Kina Cove. Three logging camps are located to the southeast in Dora Bay outside of the Project Area. Two of these camps are floating and one is land-based.

Forest Service Facilities

A Forest Service administrative site is located at the north end of the floating logging camp at the head of Polk Inlet. A Forest Service barge is also anchored at the south end of the floating logging camp at Polk Inlet. See the *Recreation* section of this chapter for a description of developed recreational facilities in the Project Area.

Log Transfer Facilities (LTF's)

The transfer of harvested timber requires that logs be removed from trucks, placed in salt water, and rafted or barged to their destination. The Polk Inlet Project Area contains two LTF's on National Forest System lands. One is on the east side of Twelvemile Arm. The second is on the west side of Polk Inlet at the floating logging camp. Both LTF's are A-frame type.

An older LTF on Twelvemile Arm was abandoned in 1977. This LTF was not considered for refurbishing because of shallow waters, proximity to the estuarine zone at the head of the arm, and the potential to construct a campground near that location.

In addition to the two LTF's currently in use, nine facilities were evaluated in detail in the 1989-94 EIS. These evaluated sites included two on the east side of Twelvemile Arm, two to the North of Old Franks Creek on Twelvemile Arm, one each on the east and west side of McKenzie Inlet, two on the south side of the west arm of Cholmondeley Sound, and one at Sunny Point near Sunny Cove.

Two additional sites are located on Native corporation land near the Project Area. One is located at Kina Cove on Twelvemile Arm, and the other at Smith Cove on Skowl Arm.

Logging camp

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Economic and Social Environment

Key Terms

Cant—a log partly or wholly cut and destined for further processing.
Discounted benefits—the sum of all benefits derived from the Project Area over the life of a project.
Discounted costs—the sum of all costs incurred from the Project Area during the life of the project.
Present Net Value (PNV)—the difference between total discounted benefits and total discounted costs associated with the alternatives calculated at a 4 percent discount rate.
Discount rate—the rate used to adjust future benefits or costs to their present value.

Introduction

Nearly 80 percent of Southeast Alaska is located within the Tongass National Forest, an area larger than the State of West Virginia. This area stretches roughly 500 miles from Ketchikan in the southeast to Yakutat in the northwest, and is mainly unpopulated wild country. Approximately 65,000 people live in 33 towns, communities, and villages located in or very near the boundaries of this, the largest forest in the National Forest System.

The economies of most communities in Southeast Alaska depend almost exclusively on the Tongass National Forest to provide natural resources for uses such as fishing, tourism, recreation, timber harvesting, mining, and subsistence uses. There is very little private land to provide these resources. Consequently, maintaining the abundant natural resources found on the Tongass is a major concern of those who make their living here.

In addition to economic activity, the quality of life is greatly enhanced by the physical environment associated with the Tongass. Southeast Alaska is regarded as a wild and magnificent place, a vast expanse of seemingly limitless scenery and vast natural resources. Many Southeast Alaskans want to preserve their local environment while maintaining their economic livelihood. With a limited resource base, resolution of this conflict is becoming increasingly difficult.

Southeast Alaska Regional Economy

The output of the Alaskan economy is dominated by the export of fishery and forestry products, the sale of North Slope oil, and the accommodation of out-of-state tourists. Because it is largely an export-oriented economy, it is heavily dependent on global macroeconomic conditions, particularly those besetting Japan and the other Pacific Rim countries.

The public sector has a significant presence in the region. State and local government employment is heavily influenced by the level of oil royalties returned to the State from Federal leases of off-shore tracts. Based on 1986 figures, Alaska's trade was led by fishery products (38.4 percent), oil and gas (22.6 percent), and wood products (9.9 percent). Historically, the rise in world oil prices from 1978 to 1982 resulted in a high growth of Alaska's economic output, faster than the United States as a whole during the same period. In 1983, the sharp rise in the value of the dollar began cutting deeply into the competitiveness of Alaskan exports. By 1985, the precipitous fall in the price of crude oil and the rise in the value of the dollar decimated Alaskan exports, and the Gross State Product contracted (Forest Service 1990b).

The sensitivity of the Alaskan economy to foreign markets is reaffirmed through the observed congruence between the quantity of Alaskan exports of forest products and economic indicators of the Japanese economy. Japan is the principal destination for Alaska's exports of forest products. As such, Alaskan exports of timber and wood products are highly dependent on wood product demand within the Japanese economy as well as the relative strength of the yen with respect to the dollar.

The dependence of the region's economy on foreign demand is widely understood in the local communities. This economic vulnerability heightens the desire to both broaden the base of economic activity and stabilize the existing job market through establishing continuity in resource supply. Although employment fluctuations over the business cycle are unavoidable, economic diversification reduces fluctuations driven by outside forces that are largely beyond direct fiscal and monetary influence of local and national policymakers.

Region of Influence (ROI)

The Primary ROI is the area whose population would sustain the largest socioeconomic impact resulting from the implementation of any of the proposed timber harvest alternatives in the Polk Inlet Project Area. For purposes of this analysis and based on regional expenditure, consumption, and residential characteristics, Prince of Wales Island has been designated as the Primary ROI. The major economic resources of the Primary ROI include recreation, fish and wildlife, and timber. Each resource is used, processed, or consumed by overlapping segments of the population located in varying proximity to the Project Area.

Within the Primary ROI, the four most populated communities are the cities of Craig, Hydaburg, Klawock, and Thorne Bay. These four communities have a combined total population of approximately 2,950 (U.S. Department of Commerce 1990a to 1990i). Because of their proximity to the Project Area, the demographic and socioeconomic characteristics of the towns of Coffman Cove, Kasaan, and Hollis will also be discussed.

The extended Primary ROI is the area that would sustain the largest indirect economic impact from socioeconomic changes in the Primary ROI. Based on regional consumption and employment patterns, it was determined that the Ketchikan Gateway Borough, primarily the City of Ketchikan which is the largest regional distribution center of consumer goods and services in proximity to the Primary ROI, would sustain the largest concentrated indirect economic impacts resulting from implementation of any of the proposed timber harvesting alternatives.

The Secondary ROI includes the entire State of Alaska, other Pacific Northwest states, and countries having direct trade with the Primary and extended Primary ROI's. Because any economic impacts on the Secondary ROI caused by implementation of any of the timber harvesting alternatives in the Polk Inlet Project Area are expected to be negligible, its further discussion is considered moot.

Economic Use of the Forest

The proposed actions in the Polk Inlet Project Area may affect the economic use of the forest by three major industries: timber, commercial fishing, and recreation including tourism. Table 3-47 displays 1990 employment information for these three major industries. For each industry, direct, indirect, and total employment is listed. In addition, for each industry, the percent of the total Southeast Alaska employment is shown.

Table 3-47
Direct and Indirect Employment for Three Major Industries—1990

	Direct Employment (Jobs)	Indirect Employment (Jobs)	Total Employment (Jobs)	Percent of SE Alaska Employment
Timber	3,543	2,570	6,113	17
Commercial Fishing	4,100	2,397	6,497	18
Recreation and Tourism	3,497	1,193	4,690	13
Total SE Alaska Employment			36,500	

SOURCE: Forest Service 1993a.

As shown in Table 3-47, commercial fishing provides the most direct and total employment, followed by timber and then by recreation and tourism. Direct and indirect employment in the three industries results in a labor force that exceeds 17,000 and nears 50 percent of the regional employment.

Each of these industries interacts with other sectors of the economy. Therefore, implementation of a policy that affects one or more of these industries would affect other sectors of the economy. Additionally, each of the three industries includes a number of subcomponents. The timber industry directly affects several economic sectors including heavy construction, lumber and paper products, and water transportation. The commercial fishing industry includes the harvesting, processing, manufacturing, support, and transportation of fish or related products. The recreation and tourism industry directly affects several economic sectors including the retail trade, service, and transportation sectors. The industry includes guides and outfitters, tours and transportation services, and sport hunting and fishing support services.

Timber Industry

Industry's History and Overview

Before 1950, the timber industry was a small portion of Southeast Alaska's economy. Numerous sawmills were located at such places as Juneau, Petersburg, Wrangell, and Ketchikan; a plywood mill operated at Juneau and a pulp mill at Port Snettisham (south of Juneau). Since 1950, the timber industry has become a major economic and social factor in Southeast Alaska.

Today, the forest products industry in Southeast Alaska processes a wide spectrum of spruce and hemlock logs into cants and finished lumber products. The wood wastes produced in sawmills is used for energy, slabs, edgings, and pulp fiber. In addition, a new market in Asia has developed for logs from lands conveyed to Alaska Native corporations through the ANCSA (Public Law 92-203). The historic timber industry employment in Southeast Alaska is presented in Table 3-48.

Under the terms of the Alaska Native Claims Settlement Act, 13 Native corporations in Southeast Alaska were entitled to select 540,000 acres of land out of the Tongass National Forest. Approximately 95 percent of these lands have been conveyed (more than 3 billion

board feet have been harvested from these lands and exported as unprocessed logs). It is estimated that between 1984 and 1989, the harvest on Native corporation lands increased almost 300 percent. Unprocessed log exports have displaced cants in the export markets. The export market for round logs has increased because of limited log availability from the Pacific Northwest. Most village corporations' timber resources in Southeast Alaska would be exhausted by 1994 with a sustained decline in harvesting (Forest Service 1992h).

Table 3-48
Timber Industry Employment in Southeast Alaska

Year	Direct Employment	Total Employment (Direct and Indirect)
1980	2,949	5,249
1981	2,733	4,854
1982	2,506	4,456
1983	2,293	4,093
1984	2,041	3,641
1985	1,947	3,447
1986	2,342	4,167
1987	2,781	4,731
1988	3,334	3,684
1989	3,516	6,066
1990	3,543	6,113
1991	3,069	5,295

SOURCE: Alaska Department of Labor. Forest Service IPASS Analysis.

The Alaska Pulp Corporation (APC) in Sitka and the KPC in Ketchikan make up Southeast Alaska's pulp industry. They produce special alpha-grade dissolving pulp for both domestic and export markets. Of the timber harvested from Southeast Alaska, 50 percent (primarily western hemlock) is used for pulp. Sources of pulpwood are the Tongass National Forest, Native corporations, and the State of Alaska. Depending on market conditions, the pulp mills have imported logs from British Columbia.

Timber Supply and Markets

In Southeast Alaska, the main sources of timber are National Forest system and Native corporation lands. By regulation, timber harvested on Federal land undergoes primary manufacture into products such as pulp, lumber, or chips unless otherwise authorized by the Regional Forester. There are exceptions to this rule. For example, Alaska cedar was determined to be in excess of domestic needs and, under permit, may be exported as unprocessed logs. Western redcedar logs may be exported by permit until such time as a competitive market exists. Timber harvest from private lands may be exported as unprocessed logs.

Wood chips being transported to market.

As indicated by the data presented in Table 3-49, the timber harvest in Southeast Alaska fluctuated in the 1980's. One of the primary reasons for the fall in timber harvest in the early to mid-1980's was the precipitous increase in the value of the dollar. This resulted in reduced overseas demand for Alaskan timber and, therefore, reduced production. A clear correlation, presented in Table 3-48, can be drawn from the reduction and subsequent increase in timber harvest to timber industry employment data throughout the 1980's. Future timber harvest on Native corporation lands will decline substantially as timber inventories are depleted in the early to mid-1990's. Only a substantial price increase will extend current levels of timber harvest permitting Native corporations to access marginal stands.

Alaska's timber industry is primarily dependent on export markets in Japan and, to a lesser extent, other Pacific Rim countries including Taiwan, Thailand, Indonesia, South Korea, and the People's Republic of China. Domestic markets are important as well; mills in Southeast Alaska ship timber to east coast and midwestern states. Alaska's major competitors in the export market are British Columbia, Pacific Northwest states, Russia, and New Zealand. The fortunes of the timber industry of Southeast Alaska are closely tied to the yen and dollar exchange rate, a stable Japanese market, and housing starts in Japan.

Timber Related Employment in Southeast Alaska

The Tongass timber program is part of a long-term effort to provide greater economic diversity and more stable, year-round employment in Southeast Alaska. To achieve that goal, the Forest Service established requirements to process National Forest timber in Alaska, and entered into long-term contracts to encourage the development of an integrated timber manufacturing industry. These contracts were established under provisions of the Tongass Timber Act of 1947. Providing sufficient timber supply opportunities to maintain timber-related employment in Southeast Alaska was an objective of the TLMP and the 705(a) provision of ANILCA.

Basic industries in Southeast Alaska include forest products, seafood, mining, tourism, and government. In Southeast Alaska, the forest products industry accounts for 19 percent of the basic industry (industry geared for exports outside of the Southeast Alaska region) employment (Forest Service 1990b). If employment in related National Forest management activities is included, this figure is about 25 percent (Forest Service 1990b). From 1980 through 1988,

Table 3-49
Timber Harvest in Southeast Alaska by Source (MMBF Log Scale)

Source	FY83	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91
Tongass NF	220.0	226.7	162.5	251.4	282.0	331.5	377.0	399.0	299.6
Native Corp.	249.3	202.3	225.3	295.9	286.1	286.4	419.8	441.7	318.8
Other	24.9	18.0	4.3	12.2	19.5	16.8	14.9	11.1	11.5
Subtotal	494.2	447.0	392.1	559.5	587.6	634.7	811.7	851.8	629.9
Imports	21.1	5.7	7.8	24.4	5.7	0.1	1.8	1.2	0.0
Total	515.3	452.7	399.9	583.9	593.3	634.8	813.5	853.0	629.9
Utility	84.4	122.5	131.0	98.1	179.3	186.0	177.6	140.4	197.1

SOURCE Forest Service 1992.

timber harvest and forest products manufacturing supported an average of 4,481 jobs in Southeast Alaska (Table 3-50). During this period approximately 60 percent of the timber harvested in Southeast Alaska came from land administered by the Forest Service (Forest Service 1990b). It is estimated by the Forest Service that harvests from the Tongass National Forest support 60 percent of the logging employment, all of the sawmilling employment, and about 75 percent of the pulp mill employment in the region. The actual level varies from year to year based on harvest and the comparative strength of the export market. In the 1980's, forest products extraction provided 12 percent of the region's wage and salary employment with the timber from the Tongass supporting about 7 percent of the region's jobs (Forest Service 1990b).

Receipts and Payments

Table 3-51 shows the total receipts from the Tongass timber program and payments to the State of Alaska. In all years, except 1987, 25 percent of all revenues received (including purchaser road credits) from the Tongass was paid to the State of Alaska (Forest Service 1990b). The funds are used to benefit public schools and public roads. The amount of funds contributed in the past have not comprised a significant portion of the total public schools and public road budgets for the cities and boroughs of Southeast Alaska.

Commercial Fishing Industry

Although the commercial fisheries industry in Southeast Alaska continues to fluctuate (Table 3-52), it remains a major component of Southeast Alaska's economy. Salmon stocks recovered from their low levels in the early 1970's. Alaska's commercial fisheries have become increasingly regulated. In the case of salmon, a permit system regulates the number of harvesters accessing the fishery. Harvest of halibut is regulated through limited openings or seasons. Seafood processing, also a vital component of Southeast Alaska's economy, has undergone some changes since 1980. Of major significance were an increased use of floating fish processing facilities and a trend toward frozen rather than canned salmon.

Table 3-50

Employment in the Wood Products Industry of Southeast Alaska, Fiscal Years 1981-1991

Employment	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Logging	1,047	991	1,010	946	1,004	1,239	1,545	1,981	2,113	2,144	1,554
Sawmills	605	540	429	395	363	331	375	468	478	500	604
Pulp Mills	1,081	975	854	700	580	772	861	892	925	899	911
Total Direct Employment[1/]	2,733	2,506	2,293	2,041	1,947	2,342	2,781	3,341	3,516	3,543	3,069
Indirect Employment[2/]	2,125	1,950	1,800	1,600	1,500	1,825	1,950	2,350	2,550	2,570	2,226
Total Employment	4,858	4,456	4,093	3,641	3,447	4,167	4,731	5,691	6,066	6,113	5,295

1/ SOURCE: Alaska Department of Labor and USDA Forest Service Region 10, Planning and Budget.

2/ Two computer simulation models (IPASS and IMPLAN) were used to estimate indirect and induced employment. The distinction between direct and indirect employment is a function of the Standard Industrial Classification (SIC) System underlying the collection and grouping of economic statistics. "Induced employment" refers to the additional number of jobs that are supported when employee wages and salaries are spent locally. Direct employment provides the best indication of the growth of an individual industry, while the sum of all three categories is a better indication of the significance of any one industry to the Region's economy.

Salmon continues to dominate the industry, both in volume and value of catch, and in harvest-related employment. The labor force and employment associated with fishing is highly seasonal. Forest Service estimates suggest that from one-half to two-thirds of the fish used by the fish-processing industry are salmon. Assuming employment in the industry is proportional to some combination of the values and volumes of fish processed, it is estimated that between one-half to two-thirds of the industry's employment is dependent on salmon. National Forest habitats produce salmon harvested in Southeast Alaska's fisheries. Assuming habitat is proportional to ownership of timberland in Southeast Alaska, it is estimated that the Tongass National Forest may contribute up to 80 percent of the regional salmon harvest. This result assumes that hatchery-reared stock in the harvest is minor and the combined catch of hatchery stocks, wild stocks originating outside Southeast Alaska, and wild stocks reared on private or State lands are approximately 20 percent of the total harvest.

Anadromous fish-rearing habitat on the National Forest lands in Southeast Alaska likely supports just under 1,850 jobs (or 55 percent of employment) in the commercial fishing and fish processing sectors. Another 700 are assumed to be employed in the retail, service, supply, and construction sectors (Forest Service 1990b). The latter distribution is a function of the business purchases and personal consumption expenditure patterns of the fishermen and fish processors. It is estimated that 9 percent of the region's population depends on the harvest of salmon spawned in the National Forest in Southeast Alaska. Individual communities may have a higher degree of dependence. Additionally, for some families, commercial fishing and processing work provides an income supplement rather than their principal source of earnings. For other families, income from fishing or cannery work is the only cash supplement to an otherwise subsistence lifestyle.

Table 3-51
Forest Receipts and Payments to the State of Alaska, Fiscal Year 1980-1992

Year	Tongass Receipts[1/]	Payments to Alaska
1980	26,024,494	6,506,124
1981	15,007,944	3,751,986
1982	21,622,764	5,405,691
1983	5,365,915	1,341,479
1984	4,063,189	1,015,797
1985	209,231	52,308
1986	1,967,240	491,810
1987[2/]	-2,033,575	—
1988	1,232,672	308,168
1989	20,183,133	5,045,783
1990	36,010,243	9,057,119
1991	36,968,718	9,242,179
1992	13,093,312	3,273,328
Total	179,715,280[3/]	45,491,772

SOURCE: Forest Service 1993a.

1/ Capital investments such as permanent roads, bridges, log transfer facilities, and timber stand improvements also contribute to the total assets of the Tongass National Forest, reduce future management costs, and are scheduled to achieve management objectives described in TLMP.

2/ Tongass receipts for fiscal year 1987 were negative as a result of Comptroller General Decision B-224730 of March 31, 1987, to retroactively implement the emergency rate redetermination for short-term sales. Without the reduction, Tongass receipts would have been positive by $2,139,943. As a result of the negative receipts, no payments to the State were made in 1987.

3/ Does not include receipts foregone as a result of the Federal Timber Contract Payment Modification Act. Estimated total value of affected contracts was approximately $54.5 million prior to the Act if all volume was harvested. Total value of the affected contracts as a result of the Act was approximately $1.2 million. The difference of $53.3 million represents receipts foregone; thus, the total Tongass receipts from the period fiscal years 1980 to 1988 would have been $126.8 million.

Table 3-52
Fish Harvesting and Employment in Southeast Alaska

Year	Salmon Harvest (1000 pounds)	Direct Employment (Jobs)	Total Employment (Jobs)
1980	93,027	3,475	4,700
1981	110,718	3,142	4,267
1982	122,991	3,332	4,507
1983	155,676	3,078	4,178
1984	154,846	3,277	4,452
1985	231,024	3,450	4,675
1986	214,997	3,500	4,750
1987	73,532	3,600	4,875
1988	90,696	3,500	4,725
1989	66,061	NA	NA
1990	39,965	4,100	6,497
1991	70,846	NA	NA

SOURCE: Forest Service 1993a, Keesler 1993.
Employment statistics not available for 1989 or 1991.

Recreation and Tourism Industry

The role and importance of the tourism industry increased significantly during the 1980's in Southeast Alaska. Cruiseships traveled the Inside Passage making regular, scheduled stops at Southeast ports. Between 1980 and 1986, cruiseship passenger numbers increased by nearly 90 percent. Total visitors to Southeast Alaska grew from 205,000 in 1983 to 350,000 in 1986 (Forest Service 1990b). The tourist season also expanded to include much of May and September. Table 3-53 summarizes tourism-related trends between 1975 and 1992. Table 3-54 summarizes tourism-related employment between 1980 and 1990.

Marketing studies by the Alaska Division of Tourism indicate "scenery, forest, mountains, out-of-doors" and "wilderness, unspoiled, rugged" were the top interests appealing to potential visitors (Forest Service 1990b). Resident recreation also increased during the 1980's as indicated by fishing and hunting license sales.

Unlike other industries, tourism and recreation is not a single industry, but a composite of many that serve more than tourists. For example, retail trade, service, and transportation serve tourists as well as local industries and residents. The labor force and employment associated with tourism and recreation are different than manufacturing. The jobs tend to be highly seasonal and low paying.

Table 3-53

Recreation and Tourism for Southeast Alaska

Year	Southeast Cruiseship Passenger Numbers 1/	Southeast Ferry System Use 2/	Airline Departure Juneau 3/	Scenic Flight Passenger Misty Fiord 4/
1975	46,279	230,000	110,660	NA
1980	86,815	276,000	155,699	3,000
1981	83,566	282,000	156,257	6,300
1982	87,358	300,000	150,871	5,200
1983	99,706	308,000	167,302	5,300
1984	118,781	311,000	168,685	7,000
1985	137,005	313,000	163,837	12,000
1986	164,400	296,070	156,667	11,900
1987	202,000	326,644	157,952	12,200
1988	198,870	344,209	167,314	8,500
1989	197,790	388,591	176,429	8,100
1990	236,325	413,393	185,310	NA
1991	242,755	405,028	190,244	NA
1992	263,046	420,436	221,011	NA

SOURCE: Forest Service 1990b.

1/ From U.S. Customs Data as collected by McDowell Group, Juneau, Alaska.

2/ From Eric Peter, Alaska Marine Highway Program - Traffic Division (465-3946), Annual Traffic Reports - *"Traffic Volumes by Port."* Represents boarding passenger numbers.

3/ From Juneau Airport Manager's Office (789-7821). Represents departing passenger numbers. Only a fraction are tourists. Included as an indication of visitation—business or pleasure—to Southeast Alaska.

4/ From Misty Fiords National Monument (225-2148).

Table 3-54
Recreation and Tourism Employment in Southeast Alaska

Year	Direct Employment (Jobs)	Total Employment (Jobs)
1980	2,100	3,000
1981	2,200	3,125
1982	2,300	3,250
1983	2,400	3,400
1984	2,500	3,550
1985	2,600	3,675
1986	2,700	3,825
1987	2,800	3,925
1988	2,750	3,900
1989	NA	NA
1990	3,497	4,690

SOURCE: Forest Service 1993a, Morse 1993.
Employment statistics not available for 1989.

Visitor accommodation and recreational expenditures by tourists and recreationists of Southeast Alaska supported an annual average of about 2,700 jobs during the 1980's (Forest Service 1990b). The purchases made by Southeast Alaska businesses and the personal consumption of their employees supported another 1,160 employees (Forest Service 1990b). Together, tourism and recreational expenditures maintained nearly 13 percent of wage and salary employment in the region.

An estimated 285 jobs in Southeast Alaska depend on the expenditures made by hunters. About 820 jobs in the region result from the purchases of sport anglers. Another 475 jobs result from the purchases made by businesses and their employees. In total, hunting- and fishing-related expenditures (excluding commercial fishing expenditures) produce approximately 6 percent of the region's wage and salary employment (Forest Service 1990b).

Demographic and Income Characteristics

State of Alaska

Between 1960 and 1990, the population of the State of Alaska grew from 230,400 to 550,000, an increase of nearly 139 percent. By and large, population growth has been relatively consistent throughout the thirty year period. Population growth projections made in the mid-1980's yields an estimated population of approximately 620,000 by 1995. However, according to 1990 Census data, population growth in the State of Alaska seems to have slowed down. Two of the primary factors in the slowdown appear to be the crude oil glut of the late 1980's which resulted in production stabilization, as well as Japan's overabundant supply of timber. In both cases, demand for labor was not as high as initially projected, producing a lower than projected population influx.

Proportionately, the State of Alaska has a higher percentage of its population living below the poverty line than the rest of the nation. The national average is approximately 12.4 percent, while the State of Alaska's is 14.4 percent. The national population classified as living in poverty has a larger average proportion of singles and single-parent households than the State

of Alaska. The demographic makeup of those classified as living beneath the poverty line in the State of Alaska is different from that of the national average. It includes a greater proportion of two-parent households.

The reason for the proportionally higher ratio of entire families living beneath the poverty line may partly be attributable to the heavy reliance on subsistence by many of Alaska's residents, particularly those of Southeast Alaska. Reliance on subsistence fishing and hunting results in the accumulation of goods without the transfer of money. This, in turn, makes any accounting of such activity difficult and highly inaccurate. The social and economic system established among many who rely on subsistence includes unofficial parallel market driven by a "complementary" barter system. In other words, a hunter will give his neighbor part of the game he caught as a gift. His neighbor the fisherman will return the favor sometime in the future with the delivery of some catch. The current measure of accounting used in establishing social and demographic statistics makes it difficult to accurately account for such transactions and, therefore, does not give a complete picture of the welfare of many of the residents of the State, particularly those of Southeast Alaska.

Southeast Alaska—Tongass National Forest

The majority of communities in Southeast Alaska are small, isolated from each other, and accessed only by air or water. Only four communities in the region are accessible by land: Skagway, Haines, and Klukwan in the north, and Hyder in the south. Juneau, Alaska's capital, with a population of nearly 24,000, is the largest community in Southeast Alaska. It is the only community with a population exceeding 20,000 and represents 40 percent of the region's total population. The mid-sized communities in Southeast Alaska are Sitka and Ketchikan with approximately 8,200 and 12,700 residents, respectively. The combined populations of Juneau, Sitka, and Ketchikan comprises approximately 70 percent of the total population of Southeast Alaska (U.S. Department of Commerce, Bureau of the Census 1990a to 1990i).

Southeast Alaska communities exhibit varying degrees of economic development and diversity; while fishing, timber, tourism, mining and government are the major economic sectors, the importance of these activities is characterized by considerable local variability. Some communities have little or no local economy in the conventional sense, and rely heavily on local fish and game resources. In these cases, sources outside the community play a major role in supplying goods and services that cannot be obtained from local subsistence. Some community-use activities depend upon a single economic activity that supports a viable local economy while others have a full range of economic variability. Although Southeast Alaska's relative economic condition is good, income and poverty levels throughout its communities vary. The larger communities of Ketchikan, Juneau, Wrangell, Petersburg, and Sitka have income levels well above the national average, with a smaller percentage of the people living below poverty levels. In many of the smaller communities where reliance on subsistence is more pervasive, the relative proportion of individuals and families living beneath the poverty level tends to be higher. However, as previously shown, the latter is a somewhat deceiving assertion because many people in these communities rely at least somewhat on hunting, fishing, gathering, and other forms of subsistence for their livelihood, which results in a reduced volume of actual financial transaction, thereby reducing the need for money.

Community Profile (Primary ROI)

Because of the number and variety of small communities within the Primary ROI, the four most populated towns—Craig, Hydaburg, Klawock, and Thorne Bay—have been selected for close review and subsequent impact analysis. These four towns differ in their population and

economic profiles. Therefore, the level and significance of any economic impacts which they may sustain will differ. Understanding some of their basic differences allows for a more poignant and specific impact analysis (see *Subsistence* section in Chapter 4). The examination of each of the following communities coupled with the socioeconomic impact analysis is designed to allow the reader a method by which to infer the level and significance of potential economic impacts on similar but smaller communities within the Primary ROI. Because of their proximity to the Project Area, the demographic and socioeconomic characteristics of the towns of Coffman Cove, Kasaan, and Hollis will also be discussed. Demographic and communal characteristics of Prince of Wales Island and the individual towns are discussed below.

Prince of Wales Island

Located about 45 miles west of Ketchikan, with an approximate population of 3,500 (U.S. Department of Commerce 1990h), Prince of Wales is the third largest island in the United States. The four major communities on the island are Craig, Klawock, Thorne Bay, and Hydaburg. The island has been the site of several lumber mills and mining camps since the 1800's. However, it was the salmon harvest that led to its permanent settlement. Klawock was the site of one of Alaska's first canneries, built in 1878. In the following years, 25 canneries were built on the island to process salmon. Today, logging is prevalent on the island. Most of the island is National Forest, although there are some Native corporations and private land holdings. In addition to timber harvesting and commercial and subsistence hunting and fishing, Prince of Wales Island offers both opportunities and adequate facilities to attract recreational tourists.

Craig

The community of Craig is located on a small island connected to Prince of Wales Island by a short cause-way. East Craig is located on Prince of Wales Island. The town can be directly accessed from outside the island through its boat harbor and seaplane float. Craig was once a temporary fishing camp for the Tlingit and Haida people, natives of the region. In 1907, with the help of local Haidas, Craig Millar established a saltery at Fish Egg Island. Between 1908 and 1911, a permanent saltery and cold storage facility, along with about two dozen houses, were built at the town's present location and the settlement was named for its founder. The town was incorporated in 1922 and continued to grow throughout the 1930's. Although the salmon industry has both prospered and floundered over the years, fishing still accounts for about half of the employment in Craig today. In recent years, increased timber harvesting on the island has contributed jobs in logging and timber processing.

As the most populated town in the Prince of Wales Island Outer Ketchikan Census area, Craig serves as the primary retail trade center on the island. With an estimated 1,260 residents, Craig is home to approximately 30 percent of the island's population (Table 3-55). Overall, the demographic distribution of the town's population is similar to that of the state. However, the town's remote nature is such that its population base is younger and appears to be more transient than the state overall. Craig's economic welfare appears to be primarily dependent on the stability of direct employment, income, and subsistence afforded to its local population from timber harvesting, fishing, and hunting. To a lesser extent, Craig's economy depends on the welfare of residents of surrounding towns who comprise a significant portion of the customer base for Craig's merchants.

City of Thorne Bay

The city of Thorne Bay began as a logging camp in 1962 and was incorporated in 1982, making it one of Alaska's newest cities. Currently, employment in the town largely depends on logging with some additional jobs found with the municipal government and a few local trades and services. Although tourism is not a mainstay of the town's economy, Thorne Bay does offer recreational opportunities as well as accommodations for its few recreational visitors.

Because of its heavy direct economic interdependence on logging and timber production, the town's population differs in its demographic makeup from Craig and most other regional towns whose economies, although dependent on timber harvesting, are more diverse. Thorne Bay's population was last reported as 569 (U.S. Department of Commerce 1990i).

A detailed breakdown of some demographic and housing characteristics of Thorne Bay is presented in Table 3-55.

Table 3-55
Selected 1990 U.S. Bureau of the Census Population and Housing Data

	Alaska	Craig	City of Thorne Bay	Hydaburg	Klawock	Kasaan	Hollis CDP	City of Coffman Cove	Ketchikan
Total Population	550,043	1,260	569	384	722	54	111	186	8,263
Male (%)	52.7	53.1	53.8	57.0	54.9	48.2	55.0	64.0	51.8
Female (%)	47.3	46.9	46.2	43.0	45.1	51.8	45.0	36.0	48.2
Median Age	29.4	28.5	31.4	28.3	29.5	31.3	36.7	34.5	31.7
Percent of Total Population Under 18	31.3	34.1	34.4	35.4	32.0	33.3	29.7	25.8	27.5
Race and Hispanic Origin (%)									
White	75.5	76.1	97.2	10.4	44.9	46.3	95.5	92.5	78.3
Black	4.1	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0
Alaska Native	15.6	22.9	1.2	89.1	54.3	53.7	2.7	7.0	15.7
Hispanic	3.2	2.4	2.3	0.5	1.7	1.9	0.9	1.1	2.5
Median Housing Price	$94,400	$94,000	$56,700	$60,000	$75,900	$55,000	$50,000	$26,300	$105,200
Median Rent	$503	$533	$398	$231	$414	$338	$275	$271	$530
Occupancy and Tenure									
Owner Occupied (%)	56.1	63.1	53.1	61.0	55.2	63.2	81.4	49.3	46.3
Renter Occupied (%)	43.9	36.9	46.9	39.0	44.8	36.8	18.6	50.7	53.7
Seasonal or Occasional Use (%)	7.3	3.6	3.0	1.5	0.7	3.3	36.6	1.2	0.8
Mobile Houses, Trailers, Other (%)	10.6	58.1	48.5	11.1	45.9	20.0	11.3	81.5	7.1

SOURCE: U.S. Department of Commerce 1990a to 1990i.

Hydaburg

The town of Hydaburg was founded in 1911 from a combination of the populations of three Haida villages. Of its total population of 384 (U.S. Department of Commerce 1990d), nearly 90 percent are classified as Alaskan Natives. The town's residents are largely involved in commercial fishing, although there are some jobs in construction and the timber industry. Subsistence is also prevalent among many of the town's residents. While housing prices in Hydaburg are comparable with those of the City of Thorne Bay (approximately 10 percent higher on average), unlike Thorne Bay, its residents are generally not transient, as reflected by the nearly 75 percent of 1-unit detached housing units comprising the housing market. A detailed breakdown of some demographic and housing characteristics of Hydaburg is presented in Table 3.12-9.

Klawock

Klawock is located on the west side of Prince of Wales Island just north of Craig. Tlingit Indians have lived in the same area, near the Klawock River, for at least 600 years. Present-day growth and development of Klawock began with commercial fisheries and with the first salmon saltery in Southeast Alaska. Two additional canneries were built in 1920 and 1924, along with an associated sawmill. In 1971, a major sawmill was constructed that operated intermittently. With harvest of Native corporation lands in the vicinity of Klawock, the ANCSA village corporation of Klawock-Heenya constructed docking and log transfer facilities near the city. Klawock is now the center of the Tlingit population on west Prince of Wales Island (TLMP Draft Revision). Over the years, the population of Klawock, like other Southeast communities, grew and then declined with the salmon harvest. The local economy is still dependent on fishing and cannery operations, along with timber cutting and sawmilling. Of its 722 residents, approximately 55 percent are Alaskan Natives. A detailed breakdown of some demographic and housing characteristics of Klawock are presented in Table 3-55.

Kasaan

The city of Kasaan is a small Haida village at the head of Kasaan Bay. It is one of a few scattered villages on the island not connected by road. Its population of 54 (U.S. Department of Commerce 1990e) is almost evenly divided between Alaskan Natives and whites. The town's residents lead a predominantly subsistence lifestyle. The Tongass Resource Use Cooperative Survey (TRUCS) (Kruse and Frazier 1988) lists the following economic sectors for Kasaan: fisheries, educational services, and local government. The average annual per capita income was the third lowest in the Project Area and less than the State and Southeast Alaska averages (Kruse and Muth 1990). A detailed breakdown of some demographic and housing characteristics of the city of Kasaan are presented in Table 3-55.

Hollis

Hollis was a mining town with a population of 1,000 from about 1900 to 1915. In the 1950's, Hollis became the site of a Ketchikan Pulp Company logging camp, and served as the base for timber operations on Prince of Wales Island until 1962 when the camp was moved to Thorne Bay. Recent State land sales have spurred the growth of a small community. It is typified by in-migrants who desire a lifestyle of subsistence. A detailed breakdown of some demographic and housing characteristics of Hollis is presented in Table 3-55.

City of Coffman Cove

Coffman Cove is a small logging community with a total population of 186 (U.S. Department of Commerce 1990a). It is one of the largest independent logging camps in Southeast Alaska.

The seasonal nature of the local economy of this town makes most of its residents transient by nature. This assertion is affirmed by examination of the town's housing market. As indicated in Table 3-55, over 80 housing units in Coffman Cove are categorized as mobile home or trailer indicating a higher than average mobility by a majority of the town's residents. A detailed breakdown of some demographic and housing characteristics of Coffman Cove are presented in Table 3-55.

Summary

As indicated in Table 3-55, there appears to be a consistent trend in the transient nature of the population and its ethnic makeup. This is substantiated by an examination of the housing markets of the four largest communities on the island. The seasonal nature of employment in Southeast Alaska requires a flexible work force. This work force utilizes temporary housing during the primary operating period.

Extended Primary ROI

Ketchikan is located on Revillagigedo Island. The Ketchikan vicinity includes Saxman, Mountain Point, Clover Pass, Ward Cove, and Herring Cove which are located on the Ketchikan road system, and Pennock Island. The Ketchikan area was a summer fishing camp for the Tlingit Indians. Development began with a saltery at the mouth of Ketchikan Creek. Ketchikan was a boom town in the late 1800's. Since the early 1900's, timber products have been an important economic influence. In 1954, a world-scale pulp mill was built in Ward Cove. Because of its location as a transportation center, fishing center, and focus for the subregion's timber industry, Ketchikan grew rapidly in the 1950's. Recently, mining has grown in economic importance with the pending development of the Quartz Hill mine, along with government, tourism, and services (TLMP Draft Revision 1991a).

Ketchikan is the fourth largest and the most visited city in the entire State of Alaska. Cruiseline traffic alone is estimated to contribute almost $12 million annually into the local economy (Alaska Department of Labor 1992). Along with tourism, Ketchikan's economy is largely dependent on timber and fishing. Therefore, economic welfare is dependent to a large extent on the state of the economy of the lower 48 states and that of Japan.

Ketchikan's labor force parallels the seasonal fluctuations of the local economy and its industries. When a downturn in the local economy creates excess labor, many people leave the area migrating to areas with favorable job opportunities. Unemployment rates in Ketchikan follow an inverse trend to the labor force. Unemployment rates peak in the winter and fall in the summer as wood products, fishing, and tourism reach maximum output and labor demand. Poor weather, which limits access for industrial operations during the winter months, typically results in high unemployment rates. The seasonal nature of employment moderates in the potential increase in unemployment during the mid-winter months of December through March.

Overall, Ketchikan's demographic makeup is similar to that of the State of Alaska. Ketchikan's larger economy and housing markets have resulted in a higher proportion of renter-occupied housing units than that of the State. The transient nature of some of Ketchikan's labor force does, however, support the previous assertion which claimed a positive correlation between the degree of transience in the labor force and the size of its white community.

Southeast Alaska Social Environment

Because of the overall commonality in social and economic character of towns involved in similar economic activities in the region, a discussion of the social environment will focus on regional characteristics.

Lifestyles

Lifestyles and the economic pursuits of residents of Southeast Alaska are varied. Many live in Southeast Alaska because of the opportunity to participate in resource-extraction occupations, primarily timber harvesting. Some desire the lifestyles afforded by remote, uncrowded living situations, while others prefer the region because of the hunting and fishing opportunities.

Native residents live in Southeast Alaska because it provides the environment that meets their cultural needs. This diversity in desired communal lifestyles and values suggests that implementation of any of the proposed alternatives may have differing impacts on the various ethnic, social, and economic segments of the region's population base.

Community Stability

Community stability is a very important consideration in planning any resource management activity in a National Forest, but it is also an evasive element to accurately describe. While income levels, employment rates, regional economic output, and so forth are useful indicators of socioeconomic trends, they do not portray the total picture, particularly the quality of life aspects.

The balance of a variety of natural and human-related resource activities is important to communities in Southeast Alaska. Management of the Tongass National Forest has direct and indirect impacts throughout the region on the level of regional economic activity as well as the quality of life. Many of the residents of the communities in Southeast Alaska derive their livelihood directly and indirectly from the Forest. These residents are also affected by changes in environmental quality, and benefit from the availability of free and abundant resources and products from the Forest. The preservation of adequate levels of availability of firewood, wildlife, and fish are significant to the sustenance and growth of the local economies as well as the quality of life of the area's residents. In light of their potential impact on community stability, forest management activities are of great public interest.

Subsistence

Key Terms

Alaska National Interest Lands Conservation Act (ANILCA)—requires evaluations of subsistence impacts before changing the use of certain Federal lands.
Birds—includes ducks (e.g., mallards, widgeons, teals, shovelers, old squaws, golden eyes, and buffaloheads), seabirds and seaducks (e.g., scoters, murres, murrelets, puffins, seagulls, and cormorants), Canada geese, seabird eggs, and other birds.
Invertebrates or shellfish—includes king crab, dungeness crab, tanner crab, shrimp, sea cucumber, sea urchins, abalone, octopus, scallops, gumboot, clams and cockles, other invertebrates, and herring eggs.
Land mammals—includes deer, moose, mountain goat, black bear, wolf, small game, and furbearers (i.e., marten and land otter).
Marine mammals—harbor seal and other marine mammals.
Nonrural—a community with more than 7,000 people; does not qualify for priority use of subsistence resources. Juneau and Ketchikan are the only two communities in Southeast Alaska which have been determined to be nonrural by the Federal Subsistence Board.
Fin fish or fish—includes cod, halibut, flounder, sole, flatfish, rock fish, herring, eulachon, hooligan, Dolly Varden, steelhead, trout, and other fish (excluding salmon).
Plants—includes beach greens, mushrooms, roots, seaweed/kelp, and berries.
Rural—all Southeast Alaska communities other than Juneau and Ketchikan; residents qualify for priority use of subsistence resources.
Salmon—includes king, sockeye (reds), coho, pink (humpback), and chum (dog).
Subsistence—customary and traditional uses by rural Alaskans of wild renewable resources.
Wildlife Analysis Area (WAA)—a division of land designated by Alaska Department of Fish and Game and used by the Forest Service for wildlife analysis.

Introduction

With the passage of the ANILCA (Public Law 96-487, December 2, 1980), Congress recognized the importance of subsistence resource gathering to the rural communities of Alaska. ANILCA defines subsistence as:

> . . .the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade (Section 803).

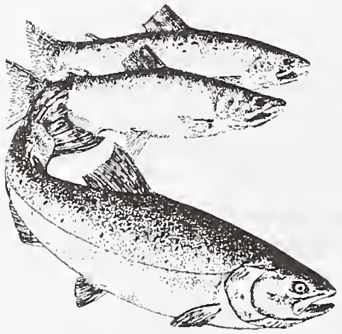
ANILCA provides for "the continuation of the opportunity for subsistence uses by rural residents of Alaska, including both Natives and non-Natives, on the public lands" (Section 801 (1)). It also legislates that "nonwasteful subsistence uses of fish and wildlife and other renewable resources shall be the priority consumptive uses of all such resources on the public lands of Alaska" (Section 802 (2)).

Effective July 1, 1990, the Federal government took over the management of subsistence use of fish and wildlife resources on Federal public lands. This management is regulated by the Federal Subsistence Board. Alaska residents of rural areas or rural communities are given

priority in the taking of fish and wildlife on public lands for subsistence uses. In Southeast Alaska, Juneau and Ketchikan have been determined to be nonrural by the Federal Subsistence Board.

Many Southeast Alaska residents use natural resources as a base or supplement to their livelihoods. Nearly a third of rural households in Southeast Alaska get at least half their meat and fish by hunting and fishing. Fish and game are widely preferred sources of food among Southeast Alaska households, regardless of their incomes. Examples of major subsistence resources include: deer, salmon, halibut, trout, harbor seals, crabs, clams, waterfowl, and berries (Kruse and Muth 1990).

Subsistence activities represent a major focus of life for rural residents. These resource- or subsistence-gathering activities include: hunting for deer, bear, marine mammals, and birds; digging clams; catching fish and shellfish (i.e., crabs and shrimp); harvesting marine invertebrates; trapping furbearers; collecting firewood; collecting herring and sea bird eggs; and collecting edible berries, plants, and roots. Subsistence goods may be eaten, traded, given away, or made into an item of use or decoration. For example, the fur from the marten or sea otter may be used for regalia costumes used in ceremony and dance.



Goldschmidt and Haas (1946) identified the land use patterns associated with Native communities that existed in the mid-20th century in Southeast Alaska. Comparing these maps with information from the 1988 Tongass Resource Use Cooperative Survey (TRUCS) maps and ADF&G Subsistence Division maps, it appears that hunting and fishing use on which lands by Natives in Southeast Alaska is still tied to some extent to historical traditions. Despite the introduction of technological innovations (such as large, modern boats) that would allow residents of Native communities to range much greater distances than in earlier periods, their use appears to be concentrated in locations generally conforming to traditional clan land ownership boundaries. The distribution of harvest locations for non-Native communities, on the other hand, is often likely to range over greater areas.

Even for households that can afford to purchase all their own food, the act of gathering subsistence resources is an important cultural aspect reflecting deeply held attitudes, values, and beliefs. Some traditional foods are not available through any other means than subsistence, and the occasions for gathering wild foods and edible plants often are social events. Historical patterns of movement, such as the annual cycle of dispersal into small family groups at summer fishing camps and then to larger gatherings at protected winter villages, are also linked to the tradition of subsistence gathering.

Average per capita income may or may not indicate the importance of subsistence to a community. While low-income individuals may have a greater dependence on subsistence gathering, individuals with a higher income may simply be in a position to have a more comfortable lifestyle because they combine their subsistence activities with their ability to purchase goods. Higher income does not deter an individual from gathering resources and sharing those with friends and family (Kruse and Muth 1990). Findings from the TRUCS (see below) indicate "members of the highest income group have the highest mean harvest and the lowest mean percent of meat derived from subsistence activities" (Kruse and Muth 1990).

Sharing of subsistence resources is important not only among households within communities, but also with extended families and friends in other areas. This includes sharing with those households that are unable to participate in the harvest of resources. Because some communities have access to resources not found in other communities, sharing of subsistence resources occurs between as well as within communities.

Tongass Resource Use Cooperative Survey (TRUCS)

In 1988, a detailed subsistence resource and use inventory of the Tongass National Forest was started as part of the TLMP Revision. The TRUCS of 1988 was directed by the University of Alaska's Institute of Social and Economic Research (ISER), in conjunction with the Forest Service and the Division of Subsistence of ADF&G (Kruse et al. 1988).

In the TRUCS, researchers went to 30 communities in Southeast Alaska and conducted interviews with randomly selected households about their 1987 subsistence uses. As part of the interview, household residents were also asked to indicate on a map those areas used for hunting and fishing. All figures used in reporting subsistence today are based on a sample of households. Therefore, it is entirely possible that actual amounts harvested were either higher or lower than reported by sample households. A detailed description of the survey is found in the TRUCS Technical Report Number One (Kruse et al. 1988).

Polk Inlet EIS Subsistence Interviews

As part of the Polk Inlet EIS, 50 personal interviews were conducted with a cross-section of Polk Inlet subsistence users. The goal of the interviews was not to replicate TRUCS but to supplement it with additional site-specific information and to obtain a more current sense of the subsistence activities occurring since TRUCS was conducted. Because of the small sample size, no statistical comparisons with TRUCS can be drawn and the sample is not considered to be statistically representative of subsistence use in the Polk Inlet Area.

The Polk Inlet subsistence users interviewed were selected from the communities of Craig, Hydaburg, Hollis, Kasaan, Klawock, Polk Inlet, and Natzuhini. Their selection was based upon household proportionality distribution, weighted distance factors, and known resource use in the Polk Inlet Project Area.

Organizations contacted to obtain potential respondents include the Ketchikan Indian Corporation (KIC), Saxman Tribal Council, City of Kasaan, the Kasaan Village Corporation (Kavilco), City of Klawock, City of Craig, City of Hydaburg, and the Hydaburg Fish and Game Advisory Board. Key informants in Hollis and Klawock were also contacted to obtain potential respondents. Interviews were conducted from July 13 through August 1, 1992. Fifty people were interviewed: 15 in Craig, 6 in Hydaburg, 8 in Hollis, 5 in Kasaan, 10 in Klawock, 4 in Polk Inlet, and 2 in Natzuhini.

The interview instrument was a shortened and modified version of the TRUCS survey (Poremba 1993). Respondents were asked questions focusing upon household use historically and in 1990 and 1991. Respondents were questioned about their use of land and sea mammals, finfish, shellfish, birds, plants, general use and potential effects on that use, recreational uses, and were asked for demographic, employment, and income information. Respondents were asked about the resources they used, the quantity obtained, the areas where each use occurred, and means of access to the area. The results of the survey are discussed below along with TRUCS survey results.

Affected Communities

In the following discussion, subsistence use is presented by community and ADF&G WAA's. Table 3-56 displays the Project Area VCU's located in the various WAA's. Data on deer, black bear, river otter, and marten harvest are collected by those units for management purposes. It should be noted that harvest figures presented below may be low due to under-reporting, especially in rural communities.

The following communities (see Figure 1-1) were selected to be analyzed in this document because of their location in or proximity to the Project Area and their identified subsistence use of the area: Craig, Hollis, Hydaburg, Kasaan, Ketchikan, and Klawock. Of these communities, all are designated rural except Ketchikan. Table 3-57 presents information taken from the 1988 TRUCS report, summarizing the importance of subsistence use for individual communities using the Project Area. Table 3-58 shows the number and percentages of households harvesting subsistence resources from the TRUCS and Polk Inlet EIS surveys.

Limited available information and interview information also were analyzed for small communities or logging camps in or near the Project Area, such as Polk Inlet and Cholmondeley Camp (see Project Area Camps, this section). To make this determination, data collected in the TRUCS (Kruse and Muth 1990) as well as ADF&G deer harvest survey statistics were used to identify communities that use the Project Area for subsistence.

Table 3-56

VCU's Within Wildlife Analysis Areas, by WAA

WAA	VCU's
1107	621, 674
1213	674, 675
1214	612, 613, 618, 619, 620
1317	610, 611, 621, 622
1332	624

SOURCE: Forest Service, Ketchikan Area, database.

Table 3-57

Per Capita Subsistence Harvest for Rural Communities Using the Project Area and Other Lands for Subsistence Gathering Activities (in edible pounds)

	Total Harvest	Deer	Other Mammals	Salmon	Other Fish	Shellfish	Misc.
Craig	186	41	9	40	63	26	7
Hollis	165	38	9	44	36	27	11
Hydaburg	337	43	8	137	83	52	14
Kasaan	185	40	2	32	33	72	6
Klawock	239	35	15	69	58	28	20

SOURCE: ADF&G 1992. Data derived from 1987 TRUCS data.

Note: See the Key Terms for a definition of each category.

Table 3-58
Number and Percent of Households Harvesting Subsistence Resources, Historically and in 1990-91

	Polk Inlet Draft EIS Interviews[1/]			
Resource	Historical[2/]	1990-91 Number	1990-91%	1987 TRUCS %[3/]
Finfish	36	26	52	
Salmon		24	48	57-71
Halibut		15	30	61-71[4/]
Bottomfish		15	30	[4/]
Trout		9	18	[4/]
Land and Sea Mammals	33	23	46	
Deer		23	46	
Furbearers		5	10	2-15[5/]
Harbor Seal		1	2	4-11[6/]
Mink		6	12	[5/]
Marten		6	12	[5/]
Land Otter		3	6	[5/]
Beaver		1	2	[5/]
Wolf		2	4	[5/]
Ermine		1	2	[5/]
Shellfish	30	26	52	42-100
Crab		22	44	
Shrimp		17	34	
Abalone		1	2	
Clams/Cockles		9	18	
Mussels		1	2	
Gumboot		2	4	
Sea Urchin		1	2	
Sea Cucumber		11	22	
Octopus		5	10	
Dungeness Crab		19	38	
Birds	15	13	26	6-20
Ducks		12	24	
Geese		12	24	
Grouse		3	6	
Ptarmigan		3	6	
Plants	34	30	60	53-71[7/]
Seaweed		2	4	
Other Plants		11	22	
Berries		24	48	
Firewood		15	30	51-85

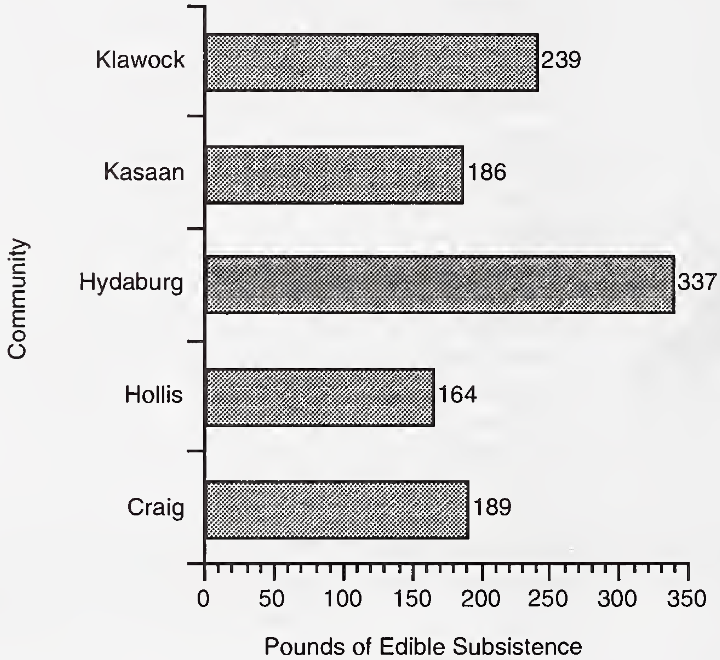
SOURCE: Langdon et al. 1992

1/ Fifty households were interviewed for the Polk Inlet EIS study.
2/ Historical use is defined as having ever harvested a subsistence resource type.
3/ Ranges are for the same communities in which residents were reinterviewed for the Polk Inlet EIS.
4/ The range of percentages given for halibut are for all finfish excluding salmon.
5/ The range of percentages given for furbearers are for all land mammals, excluding deer. This includes moose, goat, black bear, and furbearers.
6/ The range of percentages given for harbor seal are for all marine mammals, harbor seal, and others.
7/ The range of percentages given for plants excludes firewood.

All six communities included in the analysis harvested more than 150 pounds of subsistence resources per capita in 1987 (Figure 3-22). The greatest subsistence users were in Hydaburg with 337 pounds per capita. Klawock residents also had substantially greater harvests (239 pounds per capita) (Kruse and Muth 1990). On average, households in most communities included in the analysis derived one quarter or more of the meat and fish they ate in 1987 from their own subsistence harvest (Figure 3-23). Hollis residents reported that on average more than 40 percent of their meat and fish came from their own subsistence harvest. Klawock, Hydaburg, and Kasaan obtained 30 to 40 percent of their meat through subsistence harvesting. Craig residents obtained 20 to 30 percent of their meat through subsistence harvesting (Kruse and Muth 1990). The affected Resources discussion later in this section describes the primary deer harvest use areas for each community, an overall indication of subsistence use areas.

Figure 3-22

Pounds of Edible Subsistence Harvest Per Capita by Community

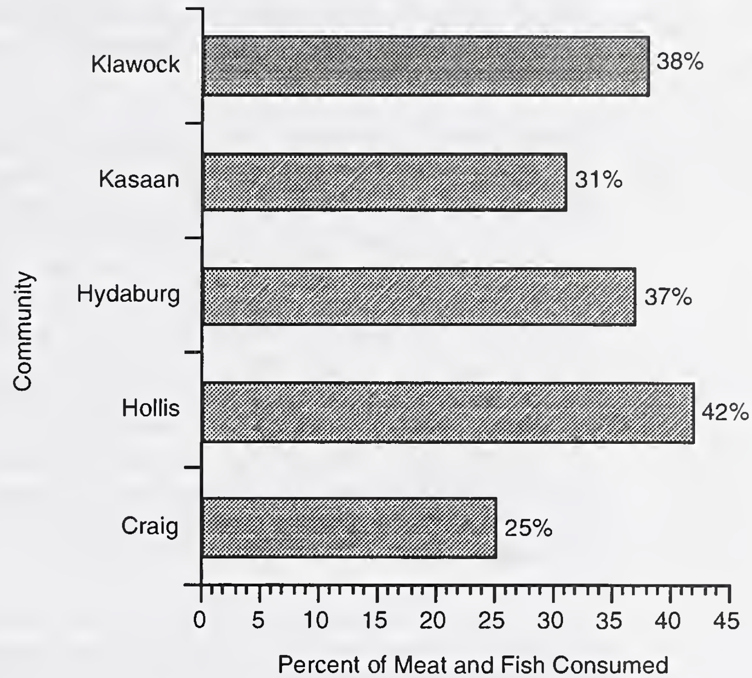


SOURCE: Kruse and Muth 1990.

Overview of Subsistence Interviews

Results of the 50 Polk Inlet Project subsistence interviews were not substantially different than the results for the TRUCS survey. Historically, 36 households harvested finfish noncommercially, 34 had harvested plants/berries/wood, 33 households harvested land or sea mammals, 30 households had harvested shellfish noncommercially, and 15 had harvested birds. In 1990 and 1991, only 30 households harvested plants/berries/wood, 26 harvested finfish noncommercially, 26 households harvested shellfish noncommercially, 23 households harvested land or sea mammals, and 13 households harvested birds. Overall, the most often cited areas for subsistence harvesting were the Hollis (cited 101 times for a range of resources harvested), Polk Inlet (cited 34 times), Kasaan Bay (33), Hollis/Klawock Road (30), Cave

Figure 3-23
Subsistence Harvest as Percent of Meat and Fish Consumed



SOURCE: Kruse and Muth 1990.

Creek/Twelvemile Creek (26), Hydaburg Road (25), and Twelvemile Arm areas (14). The most often cited means of access to harvested subsistence resources were open skiff (cited 151 times for a range of resources), car/truck (111), various other means (38), vessels longer than 30 feet (21), and vessels shorter than 30 feet (19). When interviewed in July, 48 households reported having eaten a meal or snack that included subsistence foods during the previous week. Thirty-two of these households reported that they had harvested the subsistence resource, 13 households had either harvested the food themselves or had obtained it from another household, and 3 households had received the food from other households (Langdon et al. 1992).

Thirty-three households reported that they had ever hunted for land or sea mammals and 16 stated they had not historically harvested those species. Twenty-three households reported hunting for land or sea mammals in 1990 and 1991, whereas 11 households did not. All of those households harvested deer (101 deer), five harvested furbearers, and one harvested harbor seal. Species trapped by households included mink (6 households), marten (6), land otter (3), and wolf (2). Primary areas of harvest, beginning with areas most frequently mentioned, were the Hollis (13 households), Hydaburg Road (9), Cave Creek/Twelvemile Creek (8), Twelvemile Arm (7), and Polk Inlet (6) areas. The most often cited means of access for harvesting land and sea mammals was car/truck (20 households), followed by open skiff (17) (Langdon et al. 1992).

Thirty-six households reported that they had ever fished noncommercially for finfish and 26 households reported fishing noncommercially in 1990 and 1991. Twenty-four households harvested salmon (634 salmon), 15 harvested halibut (128 halibut), 15 harvested bottomfish, and 9 harvested trout. Primary areas of harvest were the Hollis (25 households), Hollis/Klawock Road (17), Kasaan Bay (14), and Polk Inlet (12) areas. The most often cited means of access for noncommercial fishing was open skiff (35 households), followed by car/truck (24) (Langdon et al. 1992).

Thirty households reported that they had ever fished noncommercially for shellfish and 26 households reported fishing noncommercially in 1990 and 1991. Twenty-two households harvested crab (19 harvested dungeness crabs), 17 harvested shrimp, 11 harvested sea cucumber, 9 harvested clams/cockles, and 5 harvested octopus. Primary areas of harvest were the Hollis (29 households), Kasaan Bay (19), Hetta Inlet (10), Polk Inlet (8), and Twelvemile Arm (7) areas. Open skiff was the most often cited means of access (68 households for a range of species) for noncommercial shellfish harvesting (Langdon et al. 1992).

Only 15 households reported that they had ever harvested ducks or other birds and 13 of those households reported harvesting them in 1990 and 1991. Twelve households harvested ducks, 12 harvested geese, 3 harvested grouse, and 3 harvested ptarmigan. Primary areas of harvest were the Hollis (20 households), Cave Creek/Twelvemile Creek (10), and Polk Inlet (8) areas. Open skiff was the most often cited means of access (21 households) for harvesting birds, followed by car/truck (16) (Langdon et al. 1992).

Thirty-four households reported that they had ever harvested plants, picked berries, or gathered firewood. Of these households, 30 reported harvesting plants in 1990 and 1991. Twenty-four households harvested berries, 15 harvested firewood, and 11 harvested other plants. Primary areas of harvest were the Hydaburg Road (16 households), Hollis (14), Hollis/Klawock Road (13), and Cave Creek/Twelvemile Creek (8) areas. The most often cited means of access for harvesting plants was car/truck (39 households), followed by other means (13) and open skiff (10) (Langdon et al. 1992).

Community Overview

The following discussion provides a brief description of subsistence use areas and harvests of each community in or using the Project Area.

Craig

Areas adjacent to the road system are some of the major subsistence use areas within the Polk Inlet Project Area. Native subsistence users appear to prefer the islands to the west of Craig for hunting. Of those surveyed, Native subsistence use of the Polk Inlet Project Area appears to be limited to some hunting, but there is a desire to use the area more. Non-Native users seem to frequent the area more than Natives for hunting. This is perhaps due to their work activities in the area (Langdon et al. 1992).

An average of 189 pounds per capita of edible meat and fish were harvested in 1987 by Craig households. An average of six different types of resources were harvested. Invertebrates (e.g., crab and shrimp) accounted for 26 percent, and deer, salmon, and finfish other than salmon each accounted for 22 percent of the harvest for Craig households. As an indication of the extent of sharing of subsistence resources in the community, Craig residents received an average of 5 types of subsistence resources from other households. Craig hunters traveled an average of 25 miles to their most reliable deer-hunting areas. They were less likely to hunt in areas that included older or middle-aged clearcuts, or open beach. They were more likely to

hunt in areas that included muskeg, old-growth forest, roads, grassy meadows, areas above the tree line, or young clearcuts. One most common reason cited by residents for no longer hunting deer in an area was the presence of too many hunters (Kruse and Frazier 1988).

Craig residents harvested an average of 600 deer annually over an average of 2,595 hunter days from 1987 through 1991. Among Project Area WAA's, Craig households harvested deer in WAA's 1107, 1214, 1317, and 1332. WAA 1317 was the most productive with an average of 28 deer harvested annually (5 percent of the Craig harvest), followed by 22 deer annually in WAA 1332 (4 percent of the Craig harvest), 6 deer annually in WAA 1107 (1 percent of the Craig harvest), and 4 annually in WAA 1214 (1 percent of the Craig harvest) (Table 3-59). An average of eleven hunter days occurred in WAA 1107, 24 days in WAA 1214, 136 days in WAA 1317, and 76 days in WAA 1332 (Thornton 1992).

Table 3-59

Average Annual Deer Harvest by Community for Project Area WAA's and the Project Area 1987-1991

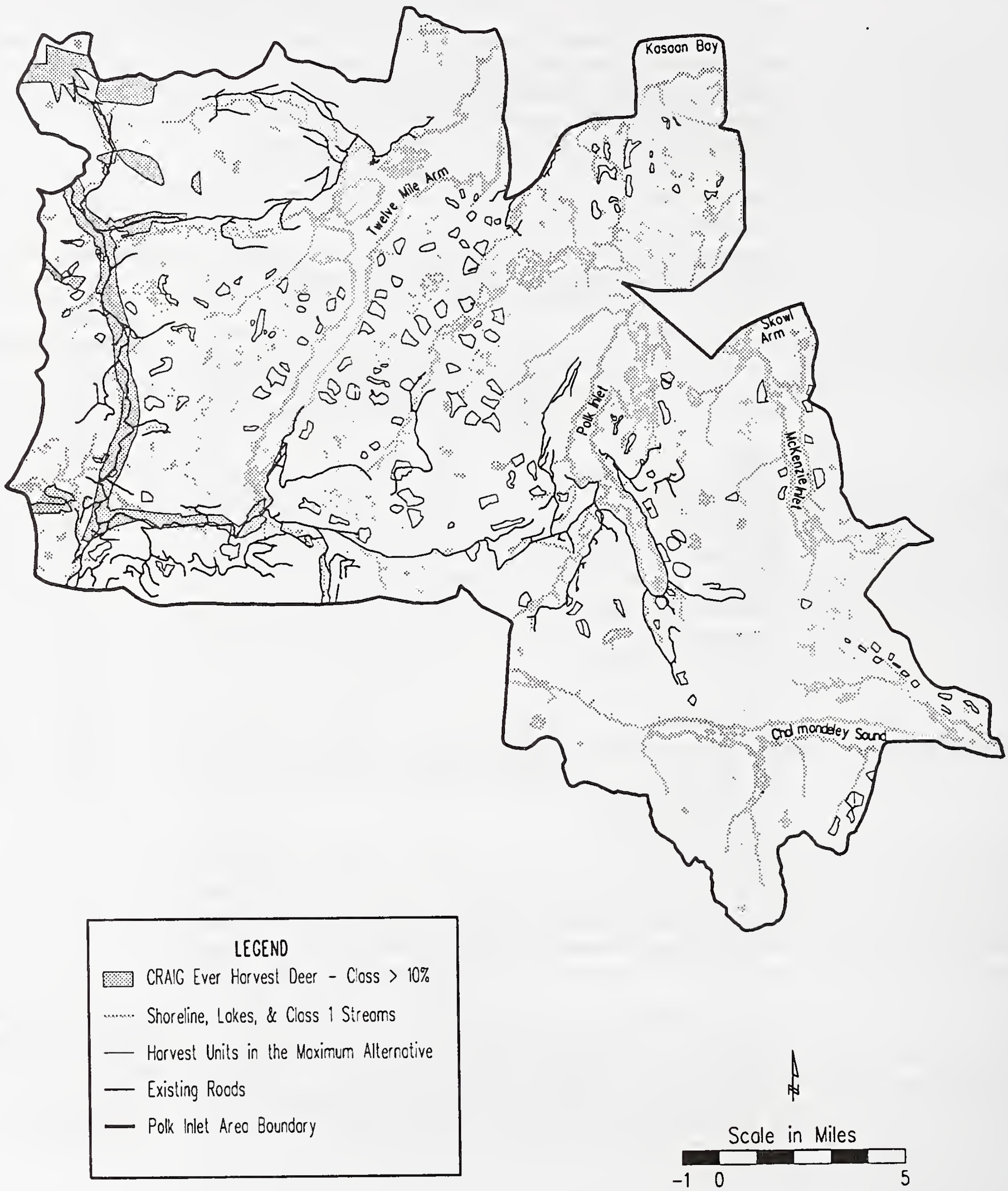
	WAA 1107	WAA 1213	WAA 1214	WAA 1317	WAA 1332	Total Project Area WAA's	Project Area[1/]
Craig	6	0	4	28	22	60	31
Hollis	0	0	0	9	0	9	8
Hydaburg	6	0	0	2	12	20	3
Kasaan	0	0	0	0	0	0	0
Ketchikan	13	13	51	19	2	98	63
Klawock	1	0	0	7	2	10	7
Cholmondeley Camp	0	0	9	0	0	9	7
Natzuhini Camp	0	0	1	0	0	1	1
Polk/Skowl Arm Camp	0	0	22	0	0	22	17
Total Subsistence	19	0	43	50	38	150	83
Total Nonsubsistence	13	14	52	23	4	106	68
Total Harvest	32	14	95	73	42	256	151
% of WAA Habitat Capability in Project Area	2	50	76	90	12		

SOURCE: Thornton 1992. Data derived from ADF&G total WAA deer harvest data.

1/ Estimate based on the percent of WAA Habitat Capability in the Project Area.

Craig subsistence users have historically hunted deer primarily in the western portion of the Project Area. They harvested in the Twentymile drainage, the western portion of the Hollis-Klawock Highway, along and the Hydaburg Road, along the Forest Service road from Hydaburg Road to the southern portion of Twelvemile Arm, and around Trocadero Bay. Areas utilized by more than 10 percent of surveyed Craig households for deer hunting are presented in Figure 3-24.

Figure 3-24
Areas in the Polk Inlet Project Area Where More Than 10 Percent of Craig Households Have Ever Hunted Deer



Black bear harvest by Craig residents averaged 2.2 bears per year for Project Area WAA's, including an estimated 1.0 bear per year within the Project Area (Table 3-60). River otter harvest averaged 1.6 per year in Project Area WAA's with an estimated 0.6 from the Project Area (Table 3-61) and marten harvest averaged 61.3 with 36.5 from the Project Area (Table 3-62).

Table 3-60

Average Annual Black Bear Harvest by Community for Project Area WAA's and the Project Area 1988-1992

	WAA					Total Project Area	Project
	1107	1213	1214	1317	1332	WAA's	Area[1/]
Craig	0.5	0	0.2	0.5	1.0	2.2	1.0
Hollis	0	0	0.2	0.5	0	0.7	0.5
Hydaburg	1.2	0	0	0	0	1.2	+[2/]
Kasaan	0	0	0	0	0	0	0
Ketchikan	0.2	1.8	4.0	0.5	0	6.5	5.2
Klawock	1.8	0	1.0	0.8	0.5	4.1	1.8
Polk/Skowl Arm Camp	0	0	0.8	0	0	0.8	0.7
Total Rural Harvest	4.0	0	2.2	1.8	1.0	9.0	4.0
Total Nonrural Harvest	10.0	4.2	16.8	9.5	6.0	46.5	28.2
Total WAA Harvest	14.0	4.2	19.0	11.2	7.0	55.5	32.2
% of WAA Habitat Capability in Project Area	3	70	87	95	22		

SOURCE: Paul 1992. Data derived from ADF&G total WAA black bear harvest data.

1/ Estimate based on the percent of WAA Habitat Capability in the Project Area.

2/ + = less than 0.1.

Table 3-61

Average Annual River Otter Harvest by Community for Project Area WAA's, the Project Area, and All Areas, 1988-1992

	WAA 1107	WAA 1213	WAA 1214	WAA 1317	WAA 1332	Total Project Area WAA's	Project Area[1/]
Craig	0.2	0	0.2	1.2	0	1.6	0.6
Hollis	0	0	0	0	0	0	0
Hydaburg	0	0	0	0	0	0	0
Kasaan	0	0	0.2	0	0	0.2	0.1
Ketchikan	4.8	1.8	0.8	0	0.2	7.6	1.0
Klawock	0	0	0	4.0	0	4.0	1.7
Polk/Skowl Arm	0	0	0	0	0	0	0
Total Rural Harvest	0.2	0	0.5	5.2	0.2	6.2	2.5
Total Nonrural Harvest	4.8	1.8	0.8	0	0.2	7.5	1.0
Total WAA Harvest	5.0	1.8	1.3	5.2	0.4	13.7	3.5
% of WAA Habitat Capability in Project Area	0	28	62	42	2		

SOURCE: Paul 1992. Data derived from ADF&G total WAA river otter harvest data.

1/ Estimate based on the percent of WAA Habitat Capability in the Project Area.

Table 3-62

Average Annual Marten Harvest by Community for Project Area WAA's and the Project Area 1988-1992

	WAA 1107	WAA 1213	WAA 1214	WAA 1317	WAA 1332	Total Project Area WAA's	Project Area[1/]
Craig	15.5	0	31.8	12.5	1.5	61.3	36.5
Hollis	0	0	0	0	0	0	0
Hydaburg	5.0	0	0	0	0	5.0	0.1
Kasaan	0	0	0	0	0	0	0
Ketchikan	12.2	42.8	18.8	2.2	2.0	78.0	41.5
Klawock	0	0	6.5	13.2	0	19.7	17.0
Polk/Skowl Arm	0	0	0	0	0	0	0
Total Rural Harvest	24.5	0	44.0	25.8	3.0	97.3	58.1
Total Nonrural Harvest	12.2	42.8	27.0	4.0	2.0	88.0	49.4
Total WAA Harvest	36.7	42.8	71.0	29.8	5.0	185.3	107.5
% of WAA Habitat Capability in Project Area	2	57	77	90	18		

SOURCE: Paul 1992. Data derived from ADF&G total WAA marten harvest data.

1/ Estimate based on the percent of WAA Habitat Capability in the Project Area.

Craig residents obtained 23 subsistence and personal-use fishing permits for 1985 through 1992 and used them in Project Area rivers and streams. Most were used in Dog Salmon Creek (entering the southwest portion of Polk Inlet) and Maybeso Creek (entering Twelvemile Arm near Hollis) (Table 3-63). Craig residents harvested an annual average of 195 sockeye, 1 coho, 73 pink, and 10 chum salmon under these permits from eastern and southeastern Prince of Wales from 1985 through 1991 (Table 3-64) (Talley 1992).

Table 3-63

Project Area Permits by Community and Stream, 1985 to 1992

	Cholmon. South/West	Dog Salmon Creek	Harris River	Maybeso Creek	Old Franks Creek	Old Tom Creek	Polk Creek	Polk Inlet	Twelve Mile Creek	Total
Coffman Cove	0	0	0	0	0	0	0	0	0	0
Craig	0	8	1	10	1	0	0	1	2	23
Hollis	0	0	0	1	0	0	0	0	0	1
Hydaburg	0	0	0	0	0	0	0	0	0	0
Kasaan	4	8	1	2	0	2	1	0	0	18
Ketchikan	3	0	0	0	0	0	0	0	0	3
Klawock	0	4	2	24	0	0	0	0	1	31
Total	7	20	4	37	1	2	1	1	3	76

SOURCE: Talley 1992. Data derived from ADF&G personal/subsistence harvest data.

Table 3-64

Average Subsistence/Personal Use Fish Permits and Salmon Harvest by Community, 1985 to 1991

		Salmon Harvest					
Community	Permits Issued	Chinook	Sockeye	Coho	Pink	Chum	Total
Coffman Cove	1	0	31	0	0	0	31
Craig	27	0	195	1	73	10	279
Hollis	6	0	57	0	2	0	59
Hydaburg	2	0	51	0	0	0	51
Kasaan	6	0	291	0	6	6	303
Ketchikan	138	0	1,041	8	7	138	1,194
Klawock	8	0	31	1	40	3	75
Thorne Bay	6	0	58	0	8	0	66
Wrangell	0	0	0	0	0	0	0
1985-91 Annual Average	193	0	1,755	10	137	157	2,059

SOURCE: Talley 1992. Data derived from ADF&G personal/subsistence harvest data.

Hollis

Hollis reported a high incidence of subsistence use within the Project Area for all resources. The only notable resource use outside the Project Area was in Karta Bay, an important subsistence fishery (Langdon et al. 1992). Areas used most by Hollis residents within the Project Area were those areas adjacent to the road system for deer hunting.

An average of 164 pounds per capita of edible meat and fish were harvested by Hollis households in 1987. Harvests included an average of 8 different types of subsistence resources. Salmon accounted for 27 percent, deer for 23 percent, finfish other than salmon for 22 percent, and invertebrates for 16 percent of the harvest for Hollis households. Hollis households received an average of 3 types of subsistence resources from other households. Hollis hunters traveled an average of 20 miles to their most reliable deer hunting areas. They were less likely to hunt open beaches, areas that included clearcuts of any age, or areas above the tree line, and more likely to hunt in areas that included old-growth forest, muskeg, roads, or grassy meadows. Hollis residents' reasons for discontinuing deer hunting in an area included the area having been logged, absence of deer, inconvenience, or development (Kruse and Frazier 1988).

Hollis residents harvested an annual average of 30 deer over an annual average of 81 hunter days from 1987 through 1991. Hollis residents hunted in WAA's 1214, 1317, and 1332 among Project Area WAA's. An annual average of 9 deer were taken in WAA 1317 (30 percent of the Hollis harvest) during 19 hunter days but no deer were taken in WAA's 1214 and 1332 over 2 and 3 hunter days, respectively (Table 3-59) (Thornton 1992).

Hollis subsistence users have historically harvested deer in the areas surrounding Hollis, on Cat Island, along Maybeso Creek, north of the Hollis-Klawock Highway toward Maybeso Creek, along Indian Creek, along the Harris River and southward to Indian Creek, on the Forest Service road north of the intersection of the Hollis-Klawock Highway and the Hydaburg Road, along Hydaburg Road, along the Forest Service road from Hydaburg Road to the southern portion of Twelvemile Arm, and a small area halfway between Twelvemile Arm and Polk Inlet. Areas utilized by more than 10 percent of surveyed Hollis households for deer-hunting are presented in Figure 3-25.

Black bear harvest by Hollis residents averaged 0.7 bear per year for Project Area WAA's, including an estimated 0.5 bear per year from the Project Area (Table 3-60). Hollis residents did not report taking any river otters or marten from Project Area WAA's during the 1988-89 through 1991-92 seasons (Table 3-61 and 3-62).

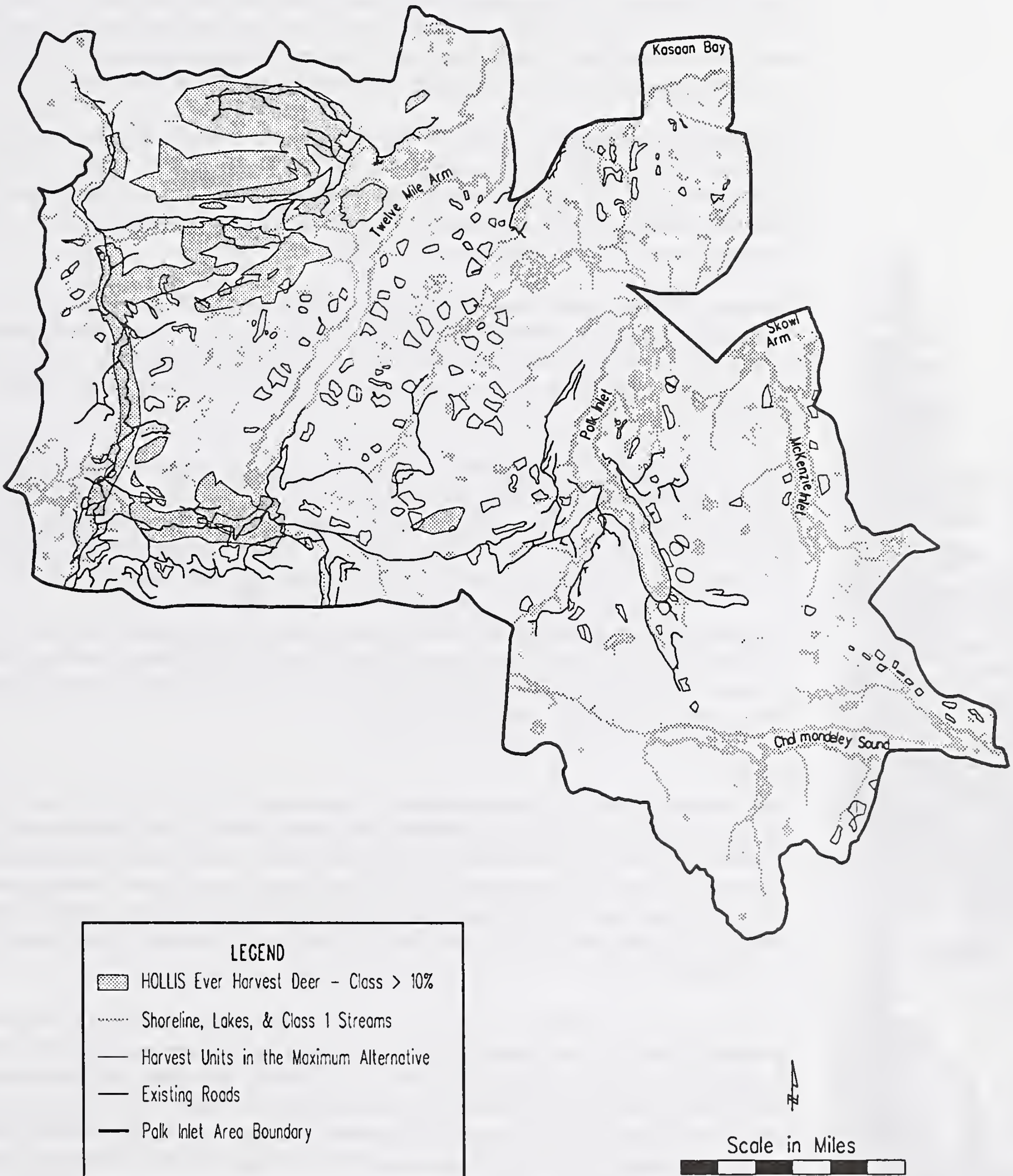
Hollis residents obtained one subsistence and personal use fishing permit (Table 3-63) for Project Area rivers and streams and used it in Maybeso Creek (entering Twelvemile Arm near Hollis) for 1985 through 1992. Hollis residents harvested an annual average of 57 sockeye and 2 pink salmon from eastern and southeastern Prince of Wales from 1985 through 1991 (Table 3-64) (Talley 1992).

Hydaburg

Hydaburg subsistence use is dispersed throughout the Project Area, according to TRUCS maps. The majority of Polk Inlet EIS interviewees indicated adherence to older subsistence practices oriented to river, oceanic, and island resources located to the west and south of Hydaburg. This type of resource use is done predominantly by skiff and fishing vessel. A few respondents indicated that the younger generation was using the road system for deer hunting, particularly Forest Service Road 21 which leads to the Polk Inlet Area. Some fishing occurs on streams in the area and some users travel to Karta Bay for sockeye harvesting. Hetta Inlet was identified as an important source of shellfish for residents (Langdon et al. 1992).

Figure 3-25

Areas in the Polk Inlet Project Area Where More Than 10 Percent of Hollis Households Have Ever Hunted Deer



An average of 337 pounds per capita of edible meat and fish were harvested by Hydaburg residents in 1987 (Figure 3-22). An average of eight types of resources were harvested by residents. Salmon accounted for 40 percent, invertebrates for 24 percent, finfish other than salmon for 16 percent, and deer for 13 percent of the harvest for Hydaburg households. Hydaburg residents received an average of more than 9 different types of subsistence resources from other households. Hydaburg hunters traveled an average of 18 miles to their most reliable deer-hunting areas. They were less likely to hunt in areas that included roads or clearcuts of any age and more likely to hunt in areas that included muskeg, old-growth forest, open beach, areas above the tree line, or grassy meadows. The most commonly cited reason by residents for no longer hunting deer in an area was that it had been logged (Kruse and Frazier 1988).

Hydaburg residents hunted an average of 177 days annually to obtain an annual average of 51 deer. Among Project Area WAA's, Hydaburg residents hunted in WAA's 1107, 1317, and 1332 (Table 3-24). WAA 1332 produced an annual average of 12 deer (23 percent of the Hydaburg harvest) over 31 hunter days and WAA 1107 produced 6 deer (12 percent of the Hydaburg harvest) over 46 hunter days (Thornton 1992).

Hydaburg subsistence users tended to use the southern portion of the Project Area. They historically harvested deer along Hydaburg Road, along the Forest Service road from Hydaburg Road to the southern portion of Twelvemile Arm, and around Trocadero Bay. Areas utilized by more than 10 percent of surveyed Hydaburg households for deer hunting are shown in Figure 3-26.

Black bear harvest by Hydaburg residents averaged 1.2 bears per year for Project Area WAA's; less than 0.1 bear per year of these were estimated to have come from the Project Area (Table 3-60). No river otters and 5.0 marten per year, were reported as taken from Project Area WAA's (Tables 3-61 and 3-62). Only 0.1 marten per year was estimated to have come from the Project Area. All reported black bear and marten harvest came from WAA 1107.

Hydaburg residents did not obtain or use subsistence and personal fishing permits in Project Area rivers and streams from 1985 through 1992 (Table 3-63). Hydaburg residents harvested an annual average of 51 sockeye salmon from eastern and southeastern Prince of Wales from 1985 through 1991 (Table 3-64) (Talley 1992).

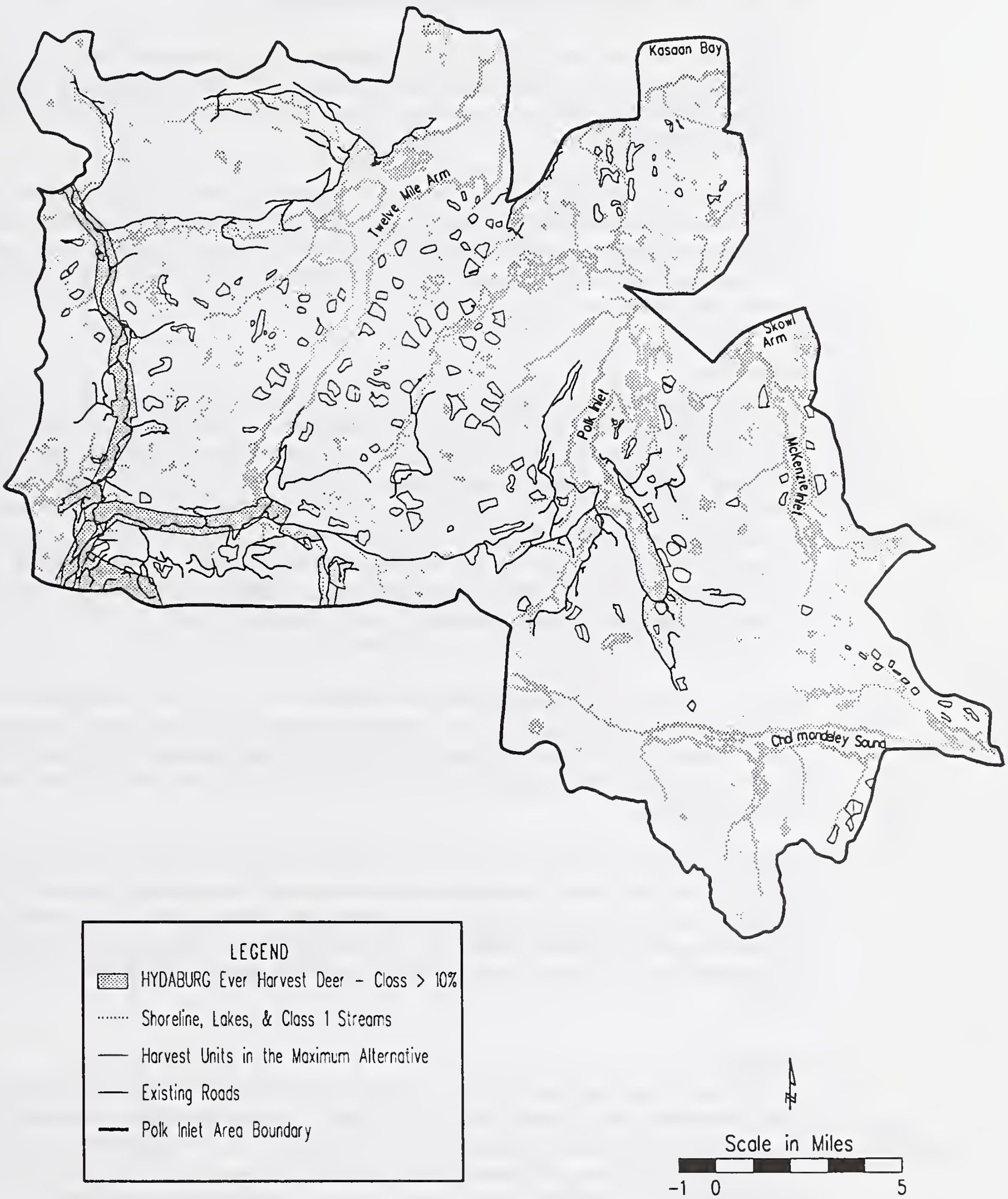
Kasaan

Major subsistence use by Kasaan residents is concentrated on the Kasaan Peninsula with Karta Bay a major focus for salmon and shellfish subsistence harvests. Deer hunting takes place primarily along the Kasaan Peninsula. There are, however, some uses of the south shore area of Kasaan Bay that are located within the Polk Inlet Project Area. These include recreational activities in Coal Bay and deer hunting in the area to the east of Coal Bay. Bottom fishing, trolling for salmon, and crab and shrimping activities also are conducted in the Project Area (Langdon et al. 1992).

An average of 186 pounds per capita of edible meat and fish were harvested by Kasaan residents in 1987. An average of eight different types of subsistence resources were harvested. Invertebrates accounted for 40 percent, deer for 22 percent, and salmon and finfish other than salmon for 17 percent of the harvest for Kasaan households. Kasaan residents received an average of almost 6 types of subsistence resources from other households. Kasaan hunters traveled an average of 7 miles to their most reliable deer hunting areas. They were less likely to hunt in areas that included roads, clearcuts of any age, grassy meadows, open beaches, or areas above the tree line, and were more likely to hunt in areas that included old-growth forest or muskeg. Kasaan residents were most likely to not hunt in an area because they had no means to get to that area (Kruse and Frazier 1988).

Figure 3-26

Areas in the Polk Inlet Project Area Where More Than 10 Percent of Hydaburg Households Have Ever Hunted Deer



Kasaan residents obtained an annual average of 6 deer over 129 hunting days during 1987 through 1991. Among Project Area WAA's, an average of 5 hunter days occurred in WAA 1214, but no deer were harvested (Thornton 1992).

Kasaan subsistence users historically harvested deer in the Hollis area, and in the area south of Kina Cove and Coal Bay to Kasaan Point and Smith Lagoon. Areas utilized by more than 10 percent of surveyed Kasaan households are shown in Figure 3-27.

No black bear or marten were reported as having been taken from Project Area WAA's during the 1988-89 through 1991-92 seasons (Tables 3-60 and 3-62). River otter harvest by Kasaan residents amounted to 0.2 otter per year from Project Area WAA's, including 0.1 from within the Project Area (Table 3-61).

Kasaan residents obtained three subsistence and personal use fishing permits and used them in the Cholmondeley South and West arms for 1985 through 1992 in the Project Area (Table 3-63). Kasaan residents harvested an annual average of 291 sockeye, less than 1 coho, 6 pink, and 6 chum salmon from eastern and southeastern Prince of Wales from 1985 through 1991 (Table 3-64) (Talley 1992).

Ketchikan

Ketchikan is not defined as a rural community and, therefore, was not included in the TRUCS study. Hence, according to Federal law, Ketchikan does not qualify for priority use of subsistence resources. However, ADF&G (Thornton 1992) does have data on deer harvesting for Ketchikan. Overall, Ketchikan residents obtained an annual average of 1,601 deer over 8,372 hunting days from 1987 through 1991 (Table 3-59). All Project Area WAA's were hunted by Ketchikan residents. WAA 1214 was the most heavily harvested. An annual average of 51 deer were taken over 243 hunting days (3 percent of the Ketchikan harvest). This was followed by 19 deer (1 percent of the Ketchikan harvest) during 80 hunting days in WAA 1317, 13 deer (1 percent of the Ketchikan harvest) over 30 hunting days in WAA 1213, and 13 deer (1 percent of the Ketchikan harvest) over 58 hunting days in WAA 1107.

Black bear harvest by Ketchikan residents averaged 6.5 bears per year for Project Area WAA's, including an estimated 5.2 per year from within the Project Area (Table 3-60). River otter harvest averaged 7.6 per year in Project Area WAA's with an estimated 1.0 per year from the Project Area (Table 3-61) and marten harvest averaged 78.0 per year with 41.5 from the Project Area (Table 3-62).

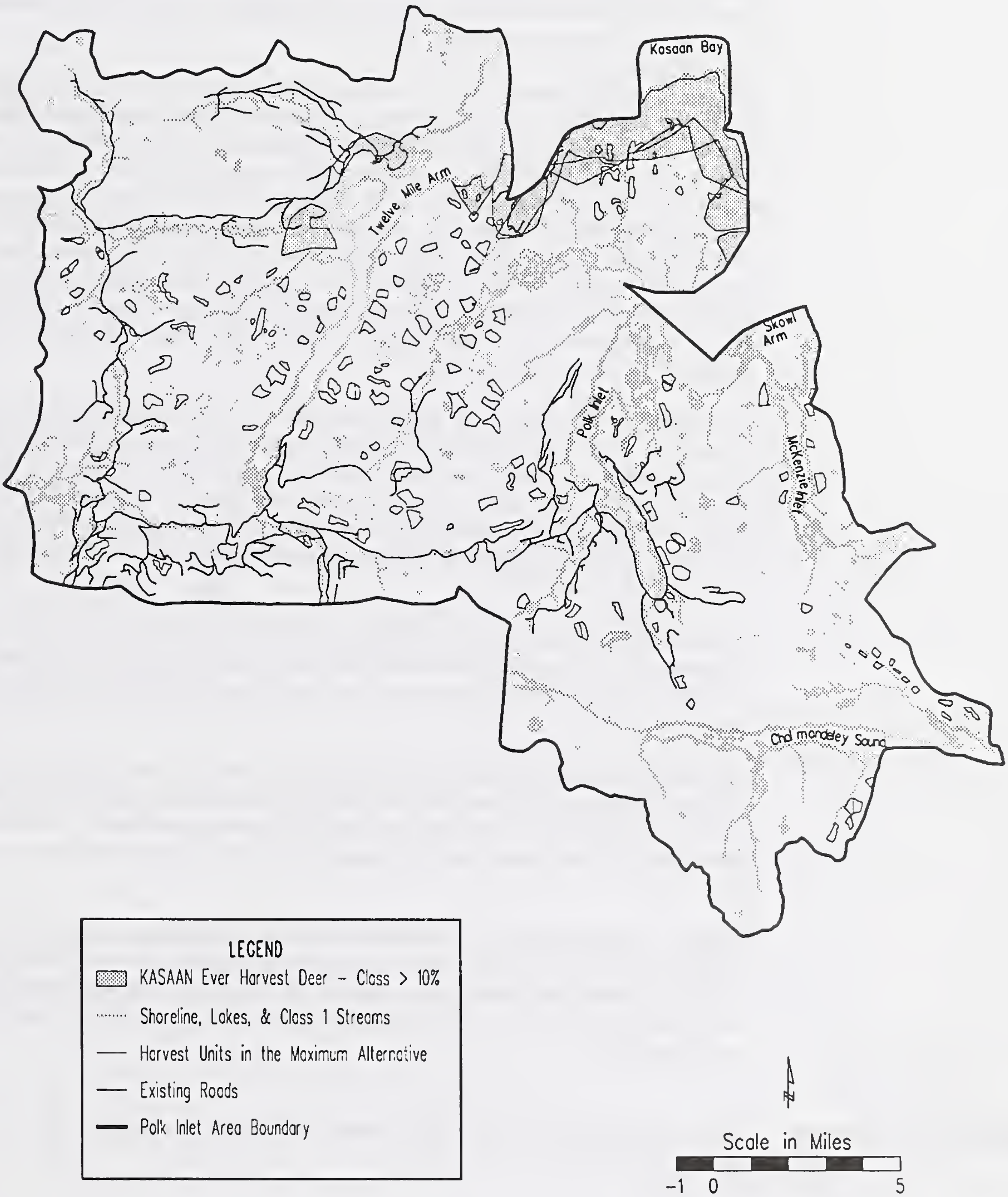
Ketchikan residents obtained 18 personal use fishing permits for the Project Area during 1985 through 1992 (Table 3-63). Four permits were used in the Cholmondeley South and West arms and eight were used for Dog Salmon Creek (entering southwestern Polk Inlet). Ketchikan residents harvested an annual average of 1,041 sockeye, 8 coho, 7 pink, and 138 chum salmon from eastern and southeastern Prince of Wales from 1985 through 1991 (Table 3-64) (Talley 1992).

Klawock

Subsistence harvest methods within the community of Klawock have been changing since the road connection with Hollis was made in the 1960's. Prior to that time, subsistence harvest was mostly tied to boating activities. Since road access to the rest of the island has been available to the residents of Klawock, there generally has been a shift from using boats to harvest subsistence materials to using trucks and cars (Ellanna and Sherrod 1987).

Figure 3-27

Areas in the Polk Inlet Project Area Where More Than 10 Percent of Kasaan Households Have Ever Hunted Deer



Most of the Klawock residents interviewed indicated that their predominant subsistence activities occur in the west coast region of Prince of Wales. A few Native residents have taken their skiffs to Hollis to utilize the Karta Bay fishery and the rich shellfish resources of the Hollis area. This seems to be an increasing trend. Some residents used to hunt on the road system north of Klawock, but declines in abundance have led them to turn to the Hydaburg Road area. They also have returned to using skiffs to hunt the outer islands away from the road system, to escape the pressure of hunting by nonlocals on the Prince of Wales road system (Langdon et al. 1992).

An average of 239 pounds per capita of edible meat and fish were harvested by Klawock residents in 1987 (Figure 3-22). An average of 8 different types of subsistence resources were harvested by residents. Salmon accounted for 32 percent, finfish other than salmon for 29 percent, deer for 19 percent, and invertebrates for 14 percent of the harvest for Klawock households. Klawock residents received an average of almost five types of subsistence resources from other households. Klawock hunters traveled an average of 35 miles to their most reliable deer-hunting areas. They were less likely to hunt in areas that included open beach, areas above the tree line, or older clearcuts, and were more likely to hunt in areas that included muskeg, old-growth forest, roads, young or middle-aged clearcuts, or grassy meadows. The most commonly cited reason for no longer hunting deer in an area was that the area had been logged (Kruse and Frazier 1988).

An overall annual average of 303 deer were taken over 1,166 hunting days by Klawock residents from 1987 through 1991 (Table 3-59). Among Project Area WAA's, hunting did not occur in WAA 1213, and 25 hunter days resulted in no takes in WAA 1214. An annual average of 7 deer (2 percent of the Klawock harvest) were taken over 24 hunting days in WAA 1317, 2 deer (1 percent of the Klawock harvest) were taken over 12 hunting days in WAA 1332, and only 1 deer (less than 1 percent of the Klawock harvest) was taken over 62 hunting days in WAA 1107 (Thornton 1992).

Within the Project Area, Klawock residents primarily used the portion of the Hollis-Klawock Highway west of its junction with the Hydaburg Road and in the upper Twentymile Drainage. Areas utilized by more than 10 percent of surveyed Klawock households are shown in Figure 3-28.

Black bear harvest by Klawock residents averaged 4.1 bears per year for Project Area WAA's, including an estimated 1.8 bears per year within the Project Area (Table 3-60). River otter harvest averaged 4.0 per year in Project Area WAA's with an estimated 1.7 from the Project Area (Table 3-61) and marten harvest averaged 19.7 with 17.0 from the Project Area (Table 3-62).

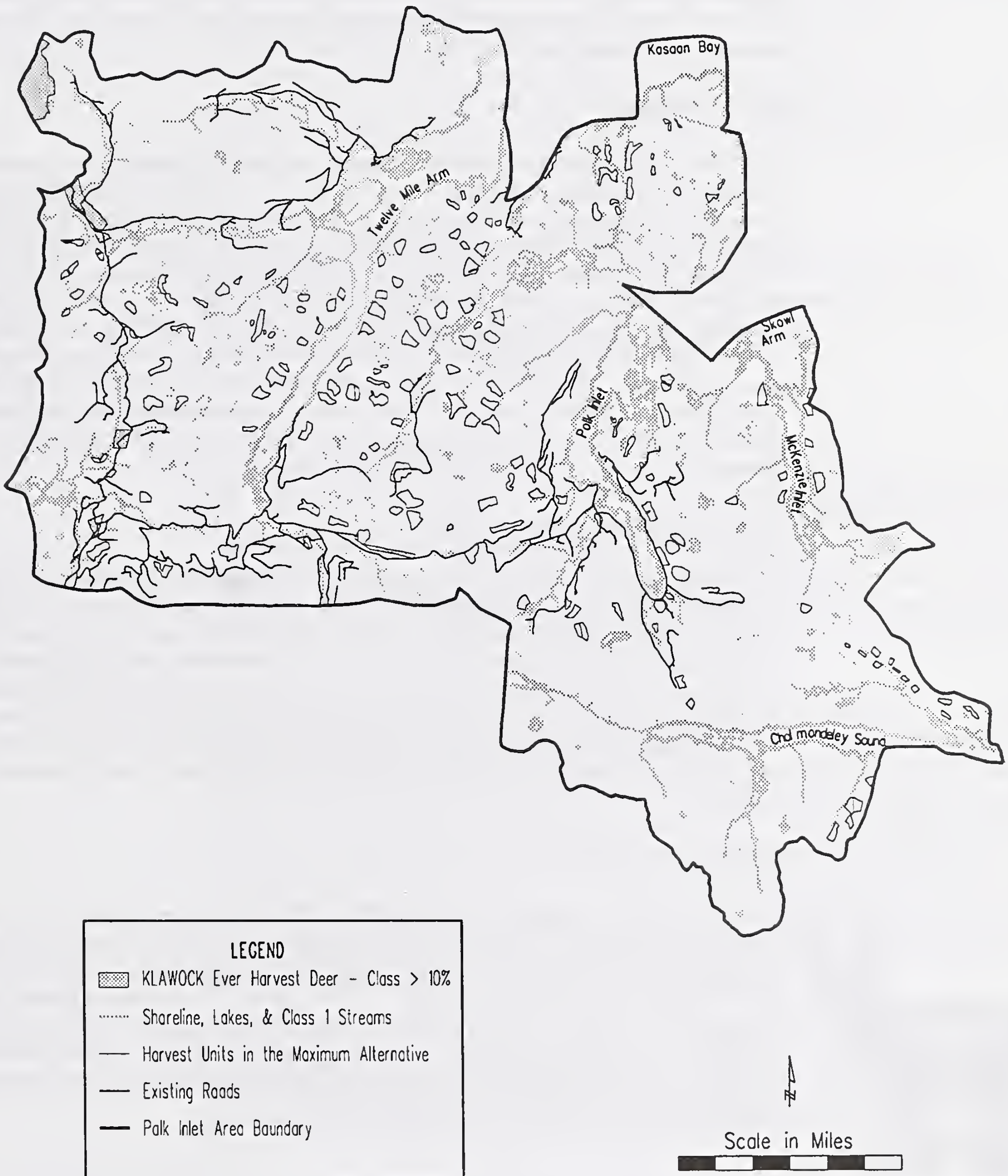
Klawock residents obtained 31 subsistence and personal use fishing permits for the Project Area during 1985 through 1992 (Table 3-63); these were mostly (24) used in Maybeso Creek. Klawock residents harvested an annual average of 31 sockeye, less than 1 coho, 40 pink, and 3 chum salmon from eastern and southeastern Prince of Wales from 1985 through 1991 (Table 3-64) (Talley 1992).

Project Area Camps

Several camps exist in or very near the Project Area. Residents of these camps also harvest subsistence resources.

Figure 3-28

Areas in the Polk Inlet Project Area Where More Than 10 Percent of Klawock Households Have Ever Hunted Deer



Natzuhini Camp

Natzuhini is a small logging camp of approximately 60 residents located about 5 miles north of Hydaburg on the Hydaburg Road. The camp was established in 1986 and has had residents every year except 1989. Fishing and deer hunting are the predominant subsistence activities of local residents. Given the proximity of the camp to the Project Area, it is estimated that 50 percent of subsistence activities occur in the Polk Inlet area (Langdon et al. 1992). Residents of Natzuhini Camp hunted in WAA's 1107 and 1214, but only took an average of 1 deer annually from the latter WAA (Thornton 1992).

Polk Inlet Camp

Polk Inlet Camp, established in 1986, is a floating camp with a population of approximately 75 people. It is located at the mouth of Dog Salmon Creek on the west coast of Polk Inlet, and is connected by logging roads to the Hydaburg Road approximately 18 miles to the southwest. The floating camp contains a post office, school, and store and has daily plane service from Ketchikan. It is estimated that over 90 percent of subsistence activities are concentrated in the Project Area and consist of deer and salmon harvesting (Langdon et al. 1992). ADF&G (Thornton 1992) provides deer harvest data for the combined Polk/Skowl Arm camps. From 1987 through 1991, these camps hunted in WAA's 1214 and 1317 and took an average of 22 deer annually from WAA 1214. This represented 88 percent of the camp's total deer harvest from all WAA's. No black bear, river otter, or marten were reported to have been taken from Project Area WAA's by Polk Inlet Camp residents during the 1988-89 through 1991-92 seasons.

Smith Cove (Skowl Arm) Camp

Smith Cove Camp (referred to in ADF&G deer data as Skowl Arm Camp) is a small logging/construction camp of approximately 40 residents located on the northeastern shore of Skowl Arm, in close proximity to the Project Area. The camp is comprised of 15 to 20 mobile home trailers and has a floating store with a post office. It is likely that a substantial portion of subsistence activities of this community occurs within the boundaries of the Project Area (Langdon et al. 1992). Deer harvest information is discussed with the Polk Inlet Camp. Smith Cove residents reported harvesting an average of 0.8 black bears per year from Project Area WAA's (Table 3-60). No river otter or marten were reported for the 1988-89 through 1991-92 seasons.

Saltery Cove Camp

Saltery Cove Camp is located on the south shore of Skowl Arm, immediately to the east of McKenzie Inlet and just outside of the eastern boundary of the Project Area. It is the home of Sportsmen's Cove, a saltwater sportfishing lodge whose activities are concentrated overwhelmingly in the waters of Clarence Straits and, to a much lesser extent, those of Skowl Arm and Kasaan Bay. In addition to the lodge, Saltery Cove is home to four or five other families, including a commercial shrimper who utilizes Polk Inlet almost exclusively for his shrimp harvests. It is highly likely that a substantial portion of subsistence activities of residents of this community are conducted within the Project Area.

Other Communities and Camps

Cholmondeley Camp harvested 9 deer annually in WAA 1214 from 1987 through 1991. WAA 1214 was hunted by Dolomi hunters but no deer were harvested. WAA's 1107 and 1214 were also hunted by Haines residents but no deer were taken. Juneau residents hunted in WAA's 1214, 1317, and 1332 but harvested no deer in WAA 1214 and obtained an annual average of 2 deer in each of WAA's 1317 and 1332. Kake residents hunted and obtained no deer in WAA 1107. Long Island Camp residents hunted in WAA's 1107, 1214, and 1332 and took an annual average of 2 deer from WAA 1332. Metlakatla residents averaged 1 deer annually from WAA 1214 within the Project Area. Sitka and Skagway residents each reported taking an annual average of 1 deer from WAA 1317. Thorne Bay residents took an annual average of 6 deer from WAA 1214 and 3 from WAA 1107. WAA's 1107 and 1317 were hunted by Whale Pass residents and an annual average of 3 deer were taken in WAA 1107 (Thornton 1992).

Affected Resources

The Project Area supports a wide variety of resources that contribute to the maintenance of the subsistence lifestyle. Identified activities include harvest of fish, deer, bear, waterfowl, furbearers, clams, crabs, shrimp, and the gathering of berries and seaweed. In addition, many residents use trees for firewood and lumber. Of these resources, deer, bear, furbearers, and salmon and trout may be most affected by the Polk Inlet Project.

Deer

The Sitka black-tailed deer is an important subsistence species found throughout the Project Area. Deer populations on Prince of Wales Island are now moderately high following a decline in the 1970's. The general hunting season is August through late December. Harvest is generally concentrated during two time periods: the first few weeks of the season in August and later in November when the rut occurs. Although most of the early deer harvest occurs from or near a timber harvest access road (Mankowske 1985), a significant harvest effort is directed toward traditional alpine areas where deer, especially bucks, are concentrated during August.

In 1987, deer constituted an average of 13 to 32 percent of the total subsistence harvest for each household: Coffman Cove, 32 percent; Craig, 22 percent; Hollis, 23 percent; Hydaburg, 13 percent; Kasaan, 22 percent; Klawock, 19 percent; Meyers Chuck, 5 percent; Petersburg, 22 percent; Thorne Bay, 20 percent; and Wrangell, 13 percent (Kruse and Muth 1990). Table 3-59 provides the average annual deer harvest by community and WAA. From 1987 through 1991, an average of 256 deer were harvested annually from Project Area WAA's. Ketchikan residents harvested the greatest number of deer (98), followed by 60 harvested by Craig residents, 22 harvested by Polk/Skowl Arm Camps, and 20 harvested by Hydaburg residents (Thornton 1992). Determining what harvest levels are sustainable assumes that habitat capability projections from the deer harvest model reflect an approximation of deer population and that the sustainable harvest is 10 percent of the population (Flynn and Suring 1989).

Based on Table 3-65, habitat capabilities for Sitka black-tailed deer appear adequate to meet current subsistence demand in all Project Area WAA's. Because subsistence use has priority over nonsubsistence use, at some time in the future it may be necessary for the Federal Subsistence Board to restrict the number of deer harvested by nonrural hunters to leave adequate numbers of deer for subsistence users.

Among local communities, Hollis appears to be the most dependent on the Project Area for deer harvest, deriving an estimated 27 percent of its total harvest from the Project Area for 1987 through 1991 (Table 3-59). The Project Area appeared to be next most important to

Hydaburg and Craig residents who took 5 percent or more of their total deer harvest from the Project Area. Ketchikan accounted for the largest number of deer harvested within the Project Area (estimated at 63), totalling 4 percent of that community's total deer harvest (Thornton 1992). The Project Area was very significant as a contributor of deer to residents of the logging camps in and near its boundaries.

Table 3-65

Habitat Capability Compared to Harvest for Sitka Black-tailed Deer[1/]

WAA	Average Annual Total WAA Harvest 1987-91[2/]	Average Annual Subsistence WAA Harvest 1987-91[2/]	Predicted Total WAA Harvest 1995 [3/]	Population Needed to Support Total WAA Harvest 1995[4/]	1995 Habitat Capability[5/]
1107	32	19	35	350	7,311
1213	14	0	16	155	1,039
1214	94	43	102	1,025	1,979
1317	72	50	78	785	1,177
1332	42	38	46	460	2,820
Total	254	150	277	2,775	14,326

SOURCE: Thornton 1992. Data derived from ADF&G total WAA deer harvest data.

1/ Values in table indicate number of deer.
2/ Includes entire WAA, including portions outside the Project Area.
3/ Assuming harvest levels increase 1.8% per year.
4/ Population needed to support harvest assumes a 10 percent harvest of the population as recommended by Flynn and Suring (1989).
5/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and State/private lands. Habitat capabilities are reduced using Project Area Patch Size Effectiveness Index value.

Black Bear

Table 3-66 displays the black bear harvest and habitat capability by WAA by year. An estimated 55 black bears were harvested annually in the Project Area from 1988 through 1992. Indices show that habitat capability may not be sufficient to meet population needs for WAA 1214 (205 versus 130, respectively) and WAA 1317 (120 versus 83, respectively). Population needed to support harvest comprise 54 percent or more of habitat capability for WAA's 1107, 1213, and 1332. Because of the apparent inadequacy of black bear habitat in WAA's 1214 and 1317 and the competition for harvesting in the remaining WAA's, conditions requiring the restrictions of nonsubsistence harvests could exist in 1995.

Table 3-66
Habitat Capability Compared to Harvest for Black Bears[1/]

WAA	Average Annual Total WAA Harvest 1988-92[2/]	Average Annual Subsistence WAA Harvest 1988-92[2/]	Predicted Total WAA Harvest 1995[3/]	Population Needed to Support Total WAA Harvest 1995[4/]	1995 Habitat Capability[5/]
1107	14	4	16	155	286
1213	4	0	4	45	59
1214	19	2	20	205	130
1317	11	2	12	120	83
1332	7	1	8	75	122
Total	55	9	60	600	680

SOURCE: Paul 1992. Data derived from ADF&G total WAA bear harvest data.

1/ Values in table indicate number of bears.
2/ Includes entire WAA, including portions outside the Project Area.
3/ Assuming harvest levels increase 1.8% per year.
4/ Population needed to support harvest assumes a 10 percent harvest of the population.
5/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and State/private lands. Habitat capabilities are reduced using estimated disturbance factors to account for disturbance associated with roads.

Furbearers

Furbearer harvest supplements the seasonal income of many area residents, most of whom are subsistence users. Different levels of trapping intensity exist, from the occasional trapper who targets primarily marten and beaver close to the road system, to those individuals pursuing all furbearers both near to and far from the road system. Harvest effort usually is concentrated along the saltwater-upland interface, and near or along major river systems. Marten appear to be the most old-growth-associated of the furbearers, and are trapped intensively in old-growth areas adjacent to the road system.

Tables 3-67 and 3-68 display the marten and river otter harvest and habitat capability by WAA. An estimated 185 marten were harvested annually in Project Area WAA's from 1988 to 1992. Indices show that marten habitat capability may be lower than that needed to support harvests in WAA's 1213, 1214, and 1317. An estimated 14 river otter were harvested annually in Project Area WAA's from 1988 to 1992. Populations needed to support current river otter harvests were lower than habitat capability in all WAA's. Habitat capabilities in most WAA's were significantly higher than that needed to support the harvest. Given the apparent inadequacy of marten habitat in WAA's 1213, 1214, and 1317, conditions requiring the restriction of nonsubsistence harvests could exist in 1995. No restrictions appear to be necessary for the harvest of river otter.

Table 3-67
Habitat Capability Compared to Harvest for Marten[1/]

WAA	Average Annual Total WAA Harvest 1987-91[2/]	Average Annual Subsistence WAA Harvest 1987-91[2/]	Predicted Total WAA Harvest 1995[3/]	Population Needed to Support Total WAA Harvest 1995[4/]	1995 Habitat Capability[5/]
1107	37	24	40	101	268 (80)
1213	43	0	47	118	53 (53)
1214	71	44	78	195	111 (11)
1317	30	28	32	80	73 (7)
1332	5	3	6	15	105 (69)
Total	185	99	203	509	610 (220)

SOURCE: Paul 1992. Data derived from ADF&G total WAA marten harvest data.

1/ Values in table indicate number of Martens.

2/ Includes entire WAA, including portions outside the Project Area.

3/ Assuming harvest levels increase 1.8% per year.

4/ Population needed to support harvest assumes a 40 percent harvest of the population. The marten model calculates the winter habitat capability.

5/ Habitat capabilities are for the entire WAA, including portions outside the Project Area. Habitat capabilities are reduced using Project Area Patch Size Effectiveness Index value. Numbers in parentheses represent habitat capability after being reduced by the Road Density Index and underestimate habitat capability in most WAA's.

Table 3-68
Habitat Capability Compared to Harvest for River Otters[1/]

WAA	Average Annual Total WAA Harvest 1988-92[2/]	Average Annual Subsistence WAA Harvest 1988-92[2/]	Predicted Total WAA Harvest 1995[3/]	Population Needed to Support Total WAA Harvest 1995[4/]	1995 Habitat Capability[5/]
1107	5	+[6/]	6	28	120
1213	2	0	2	10	97
1214	1	+	1	5	109
1317	5	5	6	28	49
1332	1	+	1	5	97
Total	14	6	16	76	473

SOURCE: Paul 1992. Data derived from ADF&G total WAA river otter harvest data.

1/ Values in table indicate number of river otters.

2/ Includes entire WAA, including portions outside the Project Area.

3/ Assuming harvest levels increase 1.8% per year.

4/ Population needed to support harvest assumes a 20 percent harvest of the population.

5/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and State/ private lands.

6/ + = less than 0.5

Waterfowl

A variety of species of ducks, along with Canada geese, are hunted in the Project Area, primarily along bays and estuaries. Goose nest sites typically occur in forested habitat within 600 feet of the forest edge; as broods mature they move from the forest interior to forest edge and intertidal areas. Vancouver Canada geese were observed in a few locations in the Project Area, primarily near shoreline areas or lakes adjacent to proposed harvest units. The habitat capability for the Project Area is 377 geese. Goose habitat was highest in WAA's 1214 and 1317, and lowest in WAA 1107.

Fish

Salmon and trout are the principal subsistence fish resources in the affected area. Pacific salmon, with the exception of chinook (king), are harvested in both fresh and saltwater in a variety of ways throughout the year (king salmon are not present in fresh water within the Project Area). The sockeye salmon is probably the most important subsistence species because of its high quality flesh and ease of harvest at traditional sites.

Major harvest sites for principal salmon species within the Project Area include:

Sockeye	Pink	Chum
Dog Salmon Creek	Maybeso Creek	Cholmondeley South/West
Cholmondeley South/West	Harris River	Maybeso Creek
Polk Inlet	Old Franks Creek	

Table 3-69 lists the stream, number of subsistence permits issued, and the annual average number of fish taken by species for subsistence purposes. This table shows that Maybeso Creek (97 salmon), Dog Salmon Creek (17 salmon), and the South and West arms of Cholmondeley Sound (17 salmon) were major salmon subsistence streams/areas from 1985 through 1991. The Harris River (12 salmon), Old Franks Creek (7 salmon), Old Tom Creek (1 salmon), Polk Inlet (3 salmon), and Twelvemile Creek (11 salmon) were also used for salmon harvesting.

Firewood and Lumber

Use of both live and dead timber occurs throughout the Project Area. Most homes use firewood as the principal heat source because of the great abundance of dead and downed timber. Use of green timber, milled from free-use standing timber, is extensive and expected to increase as the population increases.

Other Uses

Many other subsistence uses of the natural resources occur. Some examples are berry picking, mushroom gathering, use of native plants for arts and crafts, collecting other edible plants and animals, and collecting peat and seaweed for gardens. Most of these activities are not associated with a particular site, but rather occur throughout the Project Area.

Table 3-69

Average Subsistence/Personal Use Fish Permits and Salmon Harvest by Stream, 1985 to 1991

Location	Permits Issued	Salmon Harvest: Chinook	Sockeye	Coho	Pink	Chum	Total
Cholmondeley South/West	1	0	6	0	0	11	17
Maybeso Creek	8	0	3	0	85	9	97
Dog Salmon Creek	2	0	9	7	1	0	17
Polk Inlet	1	0	0	0	0	3	3
Twelvemile Creek	1	0	0	0	11	0	11
Harris River	1	0	0	0	11	1	12
Old Franks Creek	1	0	0	0	7	0	7
Old Tom Creek	1	0	1	0	0	0	1
Polk Creek	1	0	3	0	0	0	3
1985-91 Annual Average	6	0	23	7	116	23	169

SOURCE: Talley 1992. Data derived from ADF&G personal/subsistence harvest data.

Cultural Resources

Key Terms

Cultural resources—all evidence of past human-related activity. It may be historic, prehistoric, architectural, or archived in nature. Cultural resources are nonrenewable aspects of our national heritage.
Sensitivity zone—defined as "high," "medium," or "low," based on the probability that they might contain cultural resources.
SHPO—State Historic Preservation Officer

Introduction

The prehistory of Southeast Alaska is complex and still little known. Early hunters and gatherers might have been present by the late Pleistocene although the actual time of earliest occupation is not clear. The outer northwest coast might have been habitable as early as 13,000 years ago (Fladmark 1982; Mann 1983, 1986). Later periods of cultural development are better known, with some discontinuities, into historic times.

Knowledge of the human prehistory of greater Southeast Alaska is continually evolving. Sites are widespread and of many types. A recent attempt (Table 3-70) at a comprehensive cultural chronology clarified several distinct, and a few previously poorly known, prehistoric periods (adapted from Davis 1990).

Ethnohistory

The Paleomarine tradition (9000 to 4500 B.C.) defines the earliest cultural representations (Davis 1990). Ancient subsistence strategies and settlement patterns remain unclear. A transition stage (4500 to 3000 B.C.) has been hypothesized follows the Paleomarine tradition, though little is known. However, new site discoveries might fill this gap. Tool types appear to be linked to the earlier period. Beginning about 5,500 years ago, occupation sites arose along the immediate coast near the mouths of productive anadromous fish streams or adjacent to important marine resources. This pattern likely continued into historic times (Fladmark 1982). This stage of cultural development has been subdivided into three lengthy phases of eventual material cultural refinement.

Evidence of Tlingit and Haida ethnicity appears to be within this late phase, occurring a few centuries before non-Native American contact. The distribution of late prehistoric sites can be expected to coincide with locations of known historic villages, as these Alaska Natives were widely established throughout this part of Southeast Alaska. The more recent prehistoric and early Contact Period coastal localities of the Tlingit and Haida, marked by the introduction of drift iron (comparable to drift wood) for tool manufacture, are best known. The connection to the previous cultural period is clear with the additive introduction of metals and other trade goods. Numerous sites have been recorded for Sealaska Corporation (1975), the Alaska Heritage Resource Survey (1986), and by Goldschmidt and Haas (1946) as traditional use areas.

Table 3-70
Cultural Chronology

Tradition	Date	Finds	Selected Sites
American Historic	A.D. 1867	Modern tools, structures, and social systems. Gold discovered in SE Alaska in 1869.	Numerous
Russian Historic	A.D. 1798	Historic fur trade goods: metal tools, glass, ceramics, beads. Trade as early as 1750.	Numerous
NW Coast Late Phase	1000 B.P.	Native copper, stone vessels, increased use of obsidian, rise of fortified sites and villages.	Starrigavan, Russian Cove, Old Town, Yatuk Creek Rockshelter
NW Coast Middle Phase	3000 B.P.	Unilaterally barbed points, nephrite, ground burins, toggling harpoons, small end blades.	Hidden Falls, Sarkar Entrance, Young Bay, Yatuk Creek Rockshelter, Portage Arm
NW Coast Early Phase	5000 B.P.	Ground stone, bone, woodworking tools.	Hidden Falls, Rosie's Rockshelter, Coffman Cove, Traders Island
"Transitional Stage"	6500 B.P.	Ground stone, bifacial flaked stone.	Lake Eva, Chuck Lake, Irish Creek
Paleomarine	11,000 B.P.	Unifacial flaked stone, cores, blades.	Hidden Falls, Chuck Lake, Thorne River, Ground Hog Bay

SOURCE: Davis 1990.
Note: BP = Before Present (1950 AD).

The Historic Period (Stone and Stone 1980) begins with the explorations of Europeans to discover new lands and seek valuable furs. The discoveries of gold at Windham Bay in 1869 and later finds of large deposits of gold ore in Juneau by 1880 brought dramatic change to the previous maritime way of life of the Tlingit and Haida. Use of nonrenewable extractive resources over the last century considerably affected aboriginal lifestyles, especially in the northern panhandle where large gold mining operations operated until an Alaska Territory tax levied in 1937 on the gross production of precious metals discouraged further investment in state mining. This hiatus extended through World War II. There have been more recent attempts to start large-scale mining with the advent of cyanide leach techniques, such as the A-J and Kensington ventures.

Timbering and fishing, renewable extractive resource activities, have also dramatically changed the lifeways of aboriginal peoples. However, these ventures that began in the 1880's have become ongoing and integral parts of the lives of 20th century Natives in Southeast Alaska.

Ethnohistory of Project Area

At the time of first historic contact, two distinct groups occupied Prince of Wales Island: Tlingit and Haida. The Kaigani Haida are now recognized as having the rights to much of the lower half of Prince of Wales Island. Goldschmidt and Haas (1946) suggest that the Kaigani branch of the Haida moved north from the Queen Charlotte Islands sometime around 1720. It is unknown when the Haida first attempted to secure rights to this territory. Some type of interaction must have taken place long before the Haida made the final move. Most of the place names in the present Haida territory are actually of Tlingit origin, suggesting that the Tlingit were the previous occupants of the area, perhaps during Protohistoric times. When the Tlingit first arrived on the island is also unknown, although material culture remains suggest that this arrival may have been as early as 1,500 years ago.

At historic contact, the Project Area was inhabited by the Kaigani Haida. Currently, the two remaining Haida villages are located outside the Project Area. The Village of Hydaburg is southwest and Kasaan is just north of the Project Area. Traditional use rights included all of the Project Area except Trocadero Bay. Historic use of Twelvemile Arm (Goldschmidt and Haas 1946) included hunting, trapping, fishing, and gardening. Most of these activities were concentrated around the Harris River, the present day location of the village of Hollis.

The now-abandoned historic Haida village of Old Kasaan is located on the north shore of Skowl Arm across from McKenzie Inlet. All of Skowl Arm was claimed by Chief Skowl in the 1800's. Both Polk and McKenzie Inlet merge with Skowl Arm. Paul Bight at the mouth of McKenzie on Old Tom Creek was the location of a reported village. A fort was also said to have been built in 1900 to protect the people from British Columbia Indians (Goldschmidt and Haas 1946). All of McKenzie was used for trapping and berry picking.

A summer village and many smokehouses were reported to have been within Polk Inlet, although no specific locations are recorded. Polk Inlet was also a good place to trap, pick berries, and fish (Goldschmidt and Haas 1946).

All of Cholmondeley Sound was reported to have been used for fishing, trapping, and hunting. Sunny Cove once had Native houses at the site where the cannery stood. A village was also reported to have been located at the old town of Chomly on the south side of the sound (Goldschmidt and Haas 1946).

Two of Goldschmidt and Haas' (1946) informants, James Peele and Peter Jones, indicated there had been a camp in a bay on the south side of the West Arm of Cholmondeley Sound. They called this place Gahi Bay and Creek. The creek was a good source of dog and coho salmon. They also hunted, gathered wild currants, and trapped there. This location may be a present unnamed bay at the mouth of Big Creek.

For the most part, the Tlingit and Haida coexisted together on Prince of Wales Island through the 1800's up to the present, although some conflict and displacement of the Tongass Tribe population took place during the early years. With encouragement from the Federal government, the trend was to consolidate the small scattered villages into larger less numerous ones. Even with this approach, the population of the Haida declined from 1,200 persons in 1835 to 800 by the late 1800's. A similar pattern is also evident for the Tlingit (Goldschmidt and Haas 1946).

Cultural Resource Sites

Previous studies in the Project Area were limited to site-specific surveys. These include project- or timber-sale-specific examinations existing as file reports (Autrey 1990; Cline 1990; Fifield 1990, 1991; Foskin 1990; Hurley 1990; Larson 1990a, 1990b, 1990c; Larson and Fifield 1990; Larson and Foskin 1990; Lively 1991; Turck 1990a, 1990b, 1990c) providing both reports of cultural resource presence within the proposed Project Area and negative findings.


Cultural survey work

A Level III archaeological survey was performed from June 9 through 25, 1992 (Davis and Lobdell 1992) within the methodological guidelines endorsed for the area (Autrey et al. 1992). The survey was conducted on 2,200 acres within an area comprising Polk Inlet, Twelvemile Arm, Sunny Cove, West Arm of Cholmondeley Sound, McKenzie Inlet, and Trocadero Bay. The survey relocated and evaluated for significance under National Register of Historical Places criteria six previously identified cultural resource sites. It further identified, recorded, and evaluated for significance two previously unknown prehistoric sites and tested two previously known sites. All prehistoric sites found within the proposed Project Area are dated to the Middle Phase of the Northwest Coast tradition. One small site was not considered significant. Two historic period sites were also examined, although both were in states of disrepair. Many culturally modified trees were noted and recorded. Brief site descriptions are included below.

A large wooden stake fish trap (49-CRG-376) is located in VCU 674. The site is comprised of two linear groupings of wooden stakes located on a sloping tidal flat. The southern-most part contains approximately 330 wooden stakes and one whale bone. One radiocarbon date was obtained from an adze cut stake. The sample dated 1680 $\pm$50 B.P. (Before Present) with a C^{13} adjusted date of 1640 $\pm$50 B.P. (Beta-54635). The 1640 B.P. date does place the use of the fish trap at least in part during the Middle Phase of the Developmental Northwest Coast Stage. This period might predate the arrival of the Tlingit (Davis 1990).

A prehistoric site (49-CRG-377) containing a shellfish refuse area was discovered in VCU 618. Shell samples were taken from unit one for radiocarbon dating. Carbon-14 samples were recovered from near the bottom and top of the shell deposit. The sample recovered from the bottom of the shell lens dated 1360 $\pm$50 B.P. with a C^{13} adjusted age of 1770 $\pm$50 B.P. (Beta-54631). The upper shell sample dated 1290 $\pm$40 B.P. with a C^{13} adjusted age of 1700 $\pm$40 B.P. (Beta-54630). The span of the dates suggests a short time of use for the site. The radiocarbon dates would place the use of this site within the Middle Phase of the Developmental Northwest Coast stage (Davis 1990). It must be emphasized that the radiocarbon samples only date the areas of the site that were tested and may not represent the overall occupation period for the entire site.

A prehistoric site (49-CRG-342) located in VCU 619, was resurveyed and tested during the survey. Two radiocarbon samples of shell were taken, one from near the top of the shell deposit and one from under the uppermost fire-cracked rock. The uppermost sample dated 1080 $\pm$60 B.P. with an adjusted C^{13} age of 1500 $\pm$60 B.P. (Beta-54633). The lower sample dated 1150 $\pm$40 B.P. with a C^{13} adjusted age of 1560 $\pm$40 B.P. (Beta-54634). Chronological placement of the site is within the Middle Phase of the Developmental Northwest Coast stage (Davis 1990).

The small size of the site (roughly 8 feet by 8 feet), and the narrow range between the radiocarbon dates, indicates a short time span for the occupation or use. The site appears to have been used as a seasonal shellfish procurement camp. Because of the size of the site and low yield of the tests, the likelihood of the site yielding further or significant information is improbable.

49-CRG-171 is located in VCU 618. From small tests, two shell samples were submitted for radiocarbon dating. One sample from 80 centimeters was in the upper level of the shell lens. The other sample was taken at 90 centimeters, which is the bottom of the shell stratum. The

upper sample dated 2030 ±40 B.P. with an C^{13} adjusted age of 2440 ±40 B.P. (Beta-54629). The bottom test sample dated 2030 ±60 B.P. with an adjusted C^{13} age of 2450 ±60 B.P. (Beta-54632). This minimal range may be indicative of a short occupation, but perhaps only at this locale within the site. This site was probably a seasonal subsistence procurement camp. The radiocarbon dates, if they are reflective of the entire occupation, indicate a short duration for the life of the site. The age placement is within the Middle Phase of the Developmental Northwest Coast stage (Davis 1990).

The Sulzer Trail (49-CRG-044) or Portage is located on lands that have been withdrawn for selection by the Haida Native Corporation under the Haida Land Exchange Act. The Forest Service possesses an easement for the trail. An evaluation for significance was completed. The trail is about 3.5 miles long. Sulzer Trail was constructed sometime before 1917 to move supplies and people from the mines near the abandoned town of Sulzer, which is at the mouth of Beaver Creek on Sulzer Passage between Portage Bay and Hetta Inlet, to and from the West Arm of Cholmondeley Sound. Using logs laid end to end, with split log planking placed on top. Not much is left of the trail except a couple of short fragments of the logs and planking. Other sections, bridges, and walkways have rotted away or have been washed out along the streams and beaver ponds. The old trail is dilapidated and much is in total disrepair and therefore not significant beyond the field observation level.

A second historic period site (49-CRG-017), located in VCU 618, is mining related. Mining began sometime prior to the establishment and recording of a post office at the small settlement in 1905 (Orth 1971). The site is comprised of several associated facilities including a port facility, tram line with support and terminus facilities, cable system, and adits. The state of preservation of the associated remains for the mining facilities is very poor. The remains are not significant because of severe deterioration and resultant lack of heritage integrity. There are better preserved examples of an historic era mining operation within Southeast Alaska.

The Project Team encountered culturally modified trees throughout the Project Area. Three types of modification were identified: stripping, cutting, and burning. The prevalent type of modification was bark stripping of cedar trees. Cedar bark was and still is used to make baskets as well as other items. Cedar trees were stripped in one of two ways, either in a triangular or rectangular pattern. In the more common triangular stripping, one or more strips of bark were taken from a single tree. A line was cut across the bottom of the tree. The bark was peeled upward, starting at the bottom. The higher the strip, the narrower it became, until pulling off in a triangular shape at the top. This left a scar on the tree 2 to 4 meters high. Another type of stripping modification to cedar trees forms a rectangular scar. This modification involved taking off the cedar bark by cutting two horizontal lines, one near the bottom and one higher up the tree. The bark was peeled off in-between the cuts, resulting in a rectangle shaped piece of bark.

The second type of modification noted a "pitch cut tree." This type of modification involves cutting into the tree with an axe, or, in early historic/prehistoric times, with an adze. The modification is usually oval in outline and extends 20 to 50 centimeters or even more into the heart of the tree. Modifications of this type are found in both Sitka spruce, cedar, and western hemlock. This activity is associated with gathering pitch/sap or with taking the inner bark for food (Goldschmidt and Haas 1946).

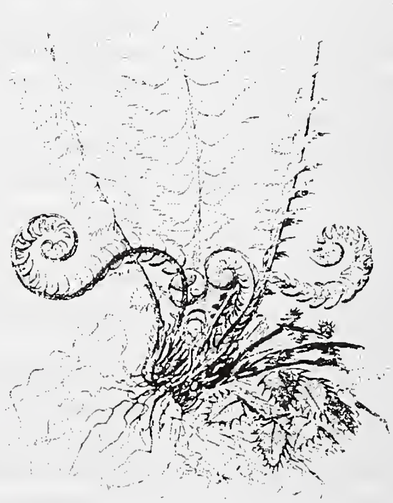
The last type of modification identified was burned trees. This modification involved the burning out of the interior of a tree. There was no preference as to the type of tree burned. The purpose of this burning was not evident from the information remaining at the site. Ethnographic information suggests that trees were burned to help fell them or to help hollow them out into a preform for a boat.

Six identified sites exist within the proposed Project Area (Table 3-71). Of the six cultural resources, three were found to be eligible for inclusion on the National Register of Historic Places, under Criteria D: sites remaining relatively intact and possessing or potentially holding critical cultural resource information that should be protected for the future. One prehistoric site was found to be so small that testing the site essentially removed the majority of the site information. Both historic sites were found to be in states of disrepair with little left to record beyond the field documentations.

Table 3-71
Cultural Sites Within the Polk Inlet Project Area

VCU	AHRS#	Relative Age	Criteria	Recommendations
618	49-CRG-171	Prehistoric	D	Eligible for the National Register
674	49-CRG-376	Prehistoric	D	Eligible for the National Register
618	49-CRG-377	Prehistoric	D	Eligible for the National Register
618	49-CRG-017	Historic	D	Not eligible for the National Register
674	49-CRG-44	Historic	D	Not eligible for the National Register
619	49-CRG-342	Prehistoric	D	Not eligible for the National Register

SOURCE: Davis and Lobdell 1992.



Visual Resources

Key Terms

Background—the distant part of a landscape; the seen, or viewed area located from approximately 3 miles to infinity from the viewer.
Character type—an area of land that has common distinguishing visual characteristics of landform, rock formations, water forms and vegetative patterns.
Characteristic landscape—usually a small portion of a character type that visually represents the basic vegetative patterns, landforms, rock formations and water forms which are in view.
Cumulative visual disturbance—the percent of a viewshed's seen area in a disturbed condition at any point in time.
Distance zone—divisions of a viewed landscape by foreground, middleground, and background zones.
Foreground—portion of viewed area from immediately adjacent to the viewing position to about a half mile from the observer's position; individual branches of trees are discernible.
Maximum Modification—a visual quality objective (VQO) which prescribes that an area may be dominated by management activities, but resulting visual characteristics should appear as a natural occurrence when viewed from the background distance zone.
Middleground—the visible terrain beyond the foreground from about _ mile to approximately 3 miles from the observer's position; individual trees are still visible but do not stand out distinctly from the landscape.
Modification—a VQO in which management activities may visually dominate the original characteristic landscape, but resulting visual characteristics must resemble natural occurrences within the surrounding area when viewed from the foreground and middleground distance zone.
Not seen—a mapping category associated with distance zones. Sensitivity Level 3 travel routes, use areas, and areas not seen or seldom seen from Visual Priority Routes and Use Areas have been mapped as Not Seen in the visual inventory. Also referred to as "Seldom Seen."
Partial Retention—a VQO in which management activities are to remain visually subordinate to the natural landscape.
Preservation—a VQO which permits ecological changes only; applies to wilderness areas and other special classified areas.
Retention—a visual quality objective which provides for management activities that are not visually evident to the casual observer.
Sensitivity level—a three-level measure of people's concern for the scenic quality of an area.
Unacceptable Modification—does not meet a VQO of Maximum Modification. Excessive modification due to management activities in which the design, size, extent, or duration are poorly related to the scale of landform and vegetative patterns in the characteristic landscape may result in unacceptable modification.
Variety class—classification of the landscape by the diversity and scenic quality of the natural landscape. The three classes are: Class A - Distinctive; Class B - Common; Class C - Minimal.
Viewshed—a defined landscape or panoramic vista seen from one or more specific viewpoints.
Visual Absorption Capacity (VAC)—an estimate of the relative ability of a landscape to absorb alteration yet retain its visual integrity.
Visual priority routes and use areas—the designated priority routes and use areas from which the proposed VQO's will be applied. Nonpriority travel routes and use areas, and those areas not seen from the Visual Priority Routes and Use Areas, are managed according to "Not Seen" criteria.
Visual Quality Objective (VQO)—management standards reflecting five degrees of acceptable alteration of the natural landscape based on a landscape's diversity of natural features and the public's concern for scenic quality.

3 Affected Environment

Introduction

The discussion of the visual resources of the Project Area is divided into three main sections. The first section describes the Visual Management System (VMS) used by the Forest Service to inventory and measure visual resources. The second section describes several of the tools used to implement the VMS. The third section is a description of the major viewsheds of the Project Area based on mapped criteria of the VMS and on field observations and documentation.

The visual resource in National Forests is recognized as a basic resource like soil, water, fish, or wildlife. The Forest Service VMS recognizes the public's concern for maintaining scenic quality in areas where other resources are being managed, harvested, extracted, or otherwise utilized.

In the Project Area, application of the management portion of the VMS is guided by three Tongass National Forest planning documents. The first is the Tongass Land Management Plan (TLMP) adopted in 1979. The second is the amended TLMP (1986a) and the third is the Draft Revision to the TLMP (1991a). Management direction with respect to each document is discussed in the second section.

Visual Management System

The VMS is based on a set of premises about the landscape and viewers. The premises include the following ideas: expected images exist among National Forest visitors; the numbers and types of viewers are critical; diverse landscape character is important; and, the capacity of each landscape to absorb alteration without losing its visual character is critical (Forest Service 1974).

The VMS includes a process to inventory and measure visual resources. The system considers biophysical and social variables. Components of the system include the visual character type, landscape variety classes, sensitivity levels, and visual quality objectives (VQO's). The first part of the process classifies the relative scenic quality of an area in its natural state according to its visual character type and landscape variety classes. The second part of the process assesses sensitivity levels, based on the numbers and types of viewers and uses anticipated to occur in that area of the National Forest.

The scenic qualities of the natural environment, as documented by the characteristic landscape and variety classes and the sensitivity levels of viewers, are combined to establish inventory VQO's. The inventoried VQO's are considered during the planning process, which leads to the establishment of management VQO's. The management VQO's are a standard to assure the desired level of visual quality is met during implementation of the Forest Plan.

Character Type

The physiographic divisions of Alaska are the basis for the 8 distinct landscape character types recognized by the Forest Service, 6 of which occur on the Tongass National Forest (TLMP 1979a). The Prince of Wales Mountains physiographic division, which encompasses the Project Area, is included in the Coastal Hill character type. The islands of Southeast Alaska comprise much of this character type.

The Coastal Hill visual character type has extensive landform variety. There are moderately-rugged glaciated mountains with rounded hummocky summits 2,000 to 3,500 feet in altitude, and some spire-like aretes up to 3,800 feet. The mountains are dissected by steep-walled, U-shaped valleys, and by fjords 600 to 1,000 feet deep. Drainages are characterized by short, swift streams, and many lakes and waterfalls (Wahrhaftig 1965).

The western hemlock Sitka spruce forest type covering most of the Project Area creates a uniform-appearing canopy from most nonaerial vantage points. The dense forest masks topographic features such as rock outcrops and drainages in many places. The visual impression is of a forest of uniform color and texture. The light-colored snags stand out against the green forest background.

Variety Classes

Each character type exhibits inherent levels of relative scenic quality. Variety classes are derived for each character type based on the degree of diversity and distinctiveness of the unaltered landscape. The landscape is mapped as Variety Class A, B, or C. These classes denote distinctive, average, or low scenic quality, respectively.

The Project Area is almost entirely rated as Class B for the viewed areas. Exceptions are Class A landscapes at the head of Polk Inlet and in the West Arm of Cholmondeley Sound near the Big Creek drainage and the south side of Sulzer Portage.

Sensitivity Levels

The VMS inventory process includes identifying the relative visual sensitivity of the landscape. There are three sensitivity levels, with 1 denoting the most sensitive and 3 the least. Sensitivity levels are established by identifying the primary and secondary travel routes, use areas, and water bodies, and then determining the likely users of the areas and their major or minor concerns for aesthetics. Seen areas with the highest sensitivity are primary travel routes and use areas where Forest visitors have a major concern for scenic qualities of the landscape. Level 2 denotes average sensitivity. Level 2 includes seen areas from primary and secondary routes and use areas where most Forest visitors do not have a major concern for scenic qualities. Level 3 includes seen areas from secondary travel routes and use areas where people tend to be involved in commercial uses of the Forest and have minor concern for aesthetics. Level 3 also includes land not seen from travel routes and usage areas.

Distance Zones

Distance zones are divisions of a viewed landscape. They describe the part of a characteristic landscape being inventoried or evaluated. The three distance zones are foreground, middleground and background. In the foreground zone, which is within one-fourth to one-half mile from the viewer, details are easily perceived. Middleground is generally from the foreground to about 3 to 5 miles from the observer. For example, texture is perceived based on masses of vegetation rather than individual trees. The background zone extends from middleground to infinity (Forest Service 1974).

In the Project Area, foreground and middleground views are predominant because of the enclosed nature of the landscape. There are few viewing locations with visible background landscape elements.

Large portions of the Project Area are mapped as not seen. Because all National Forest System lands can be seen from aircraft or high vista points, a minimum visual quality objective is determined (Forest Service 1974). But, some National Forest land is not seen from travel routes or use areas, or is only occasionally seen by Forest visitors. These areas on the Tongass National Forest are mapped as not seen.

Visual Quality Objective (VQO)

Inventory VQO's are based on the visual resource values of landscape variety, sensitivity levels, and viewer distance zones. The inventoried VQO's are considered when planning management activities on the Forest. These VQO's are benchmarks against which determinations are made regarding the visual compatibility of management activities, such as timber harvest, with the existing visual condition of the landscape.

The VQO's include Preservation (P), Retention (R), Partial Retention (PR), Modification (M), and Maximum Modification (MM). Unacceptable Modification (UM) describes a visual condition that can occur when excessive modification results from the scale, extent, or duration of activities. UM is not a visual quality objective. Definitions are in the Key Terms at the beginning of the chapter.

Existing Visual Condition (EVC)

The Existing Visual Condition (EVC) is a measure of the visual condition currently observed in an area. The EVC serves as a tool to identify issues, analyze management situations, estimate effects of alternatives, monitor, and serve as an historical record of the degree and amount of physical alteration of the landscape. It is a baseline for comparing effects of alternatives and the actual landscape condition with the proposed VQO. The Future Visual Condition (FVC) represents the visual condition level that would exist after proposed management activities are implemented.

The EVC and FVC are rated by six types: Untouched (I), Natural Appearing (II), Slightly Altered (III), Moderately Altered (IV), Heavily Altered (V), and Drastically Altered (VI). These visual condition types correspond to the VQO's: Preservation, Retention, Partial Retention, Modification, and Maximum Modification, respectively. Unacceptable Modification, which is not a VQO, corresponds to Drastically Altered.

Visual Absorption Capability (VAC)

Visual Absorption Capability is a measure of the relative ability of a landscape to absorb alteration yet retain its visual integrity. The factors of landscape complexity, slope, and distance have been identified as generally most important for evaluating VAC in Region 10 (Forest Service 1982).

There are three levels of VAC—high, medium, and low. A seen area with high VAC generally will accommodate alteration with less visual impact. However, VAC also serves as a "leveling influence" (Anderson et al. 1979). This is because a VQO of Retention or Partial Retention may be easy to obtain in an area of high VAC. On the other hand, a low VAC rating would suggest management caution even in areas of lenient visual quality objectives, such as Modification and Maximum Modification.

Project Area Visual Resource Management Direction

Direction for project-level management of the visual resource comes from several Forest Service planning documents. The primary direction comes from the Tongass Land Management Plan adopted in 1979 and amended in 1986 and 1991 (TLMP 1979a as amended). Each amendment has become more specific in the management direction for visual resources on the Tongass National Forest. The most recent and specific guidance comes from the TLMP Draft Revision (TLMP 1991a) which was undergoing review and analysis during preparation of this EIS.

TLMP-adopted Land Use Designations (LUD's) are for National Forest System lands and incorporate management direction for all resources. Most of the Project Area is designated LUD IV, which are lands where intensive use and development opportunities are emphasized for commodity or market resources. Two areas are LUD III, where high use or high amenity values result in emphasis on management for multiple uses. The LUD III areas are at the mouth of Twelvemile Arm on both sides of the inlet in Management Area K17 (VCU 611) and surrounding the West Arm of Cholmondeley Sound in Management Area K18 (VCU 674).

Management direction is given by the VQO's adopted in the Forest Plan. These VQO's are to be achieved through the management activities taking place on the National Forest System lands. The same five levels of VQO's used in the inventory process are used to describe the acceptable levels of alteration to the natural landscape permitted due to management activities.

For the LUD III area in the Hollis-Twelvemile Arm area, the 1986 TLMP amendment states that the long-term VQO from the main line roads (including the Alaska Marine Highway route) through the area will be Retention to Modification. It further states that because of the vast areas of second growth along the Hollis-Klawock Road and many rock pits adjacent to the road, visual enhancement and rehabilitation are short-term objectives. No specific VQO's have been adopted for the LUD III area surrounding the West Arm of Cholmondeley Sound.

The 1986 TLMP amendment also identified a number of acres in each LUD III area that are "high visual sensitivity." For those areas, typically at higher elevations, an extended rotation of 200 years was recommended. In Management Area K17, 5,586 acres of high and 5,803 acres of medium visual sensitivity were identified. In Management Area K18, 3,648 acres of high and 3,064 acres of medium visual sensitivity were identified.

More specific management direction is included in the TLMP Draft Revision (1991a). In it, the VQO's have been integrated into the management prescriptions for each of the land use designations and will be adopted with the implementation of the revised Forest Plan. The proposed revision also identifies Visual Priority Routes and Use Areas from which the scenic quality of Tongass National Forest lands will be managed.

There are two areas where the direction given in the current TLMP conflict with the direction in the TLMP Draft Revision. One is in the Hollis area at the mouth of Twelvemile Arm. In the current TLMP, the LUD III southeast boundary is mapped so that a portion of the LUD IV is visible from the Alaska Marine Highway route and terminal at Hollis. The description of the intent in the TLMP indicates that the viewshed from the ferry route and terminal would be included in LUD III. This could be accomplished by adjusting the LUD boundary. Under the TLMP Draft Revision, the LUD III boundary is the line separating a Scenic Viewshed from a Timber Production LUD. The VQO for a Timber Production LUD is Maximum Modification for middleground views. This exceeds the adopted VQO of Modification in the TLMP as amended.

The other area is at the intersection of the Hollis-Klawock Highway and Hydaburg Road, two main line roads. The TLMP as amended recommends VQO's in the range of Retention to Modification. The TLMP Draft Revision places part of the view corridor in a Timber Production LUD which would allow for Maximum Modification in the middleground. The intent of the TLMP indicates that the view corridor should meet VQO's ranging from Retention to Modification. In the TLMP Draft Revision, most of the Hollis-Klawock Highway corridor is included in a Modified Landscape LUD, for which the VQO in a middleground view is modification. Adjusting the boundary of the Modified Landscape LUD to include the view corridor south of the intersection and managing it according to those standards would alleviate this discrepancy.

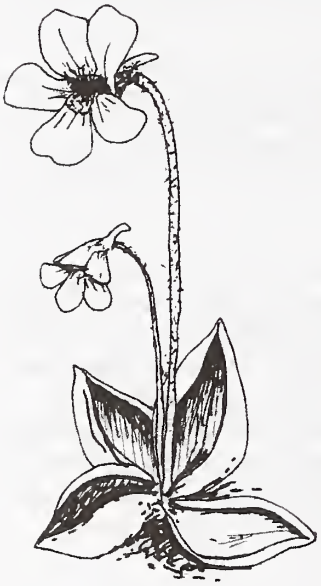
Visual Priority Routes and Use Areas

The Draft Revision to the TLMP indicates the analysis for development activities is to be based on views from Visual Priority Routes and Use Areas. In the Project Area, Visual Priority Routes include the following: Alaska Marine Highway ferry route; Hollis-Klawock Highway corridor; Hydaburg Road corridor, and Forest Road 21 from the Hydaburg Road to Twelvemile Arm. Visual Priority Saltwater Use Areas include the Twelvemile Arm proposed campground site and foreground area immediately across from the campground; about 1 mile off shore from Skowl Arm to the entrance of Cholmondeley, and the West Arm of Cholmondeley Sound, including Sunny Cove.

The only community in the Project Area listed as a visual priority is Sunny Cove. The community of Hollis is not specifically listed because the area is included in major travel route designations (personal communication, J. Short, Landscape Architect, Ketchikan Area. Tongass National Forest, May to September, 1992). Visual priority recreation areas include the One Duck Trail and shelter and Trocadero Bay Trail. Goose Bay, near the mouth of Polk Inlet, is the only boat anchorage within the Project Area designated as a visual priority area.

Cumulative Impacts

In assessing cumulative visual impacts, the standards and guidelines direct consideration of the visual condition of adjacent non-National Forest System lands during the planning of development activities on the National Forest (Forest Service 1992f).



Cumulative visual disturbance (CVD) guidelines are being proposed in the TLMP Draft Revision (TLMP 1991a). The CVD guideline is a function of the VQO and the VAC. For example, for timber harvest activities in an area with Partial Retention VQO and Low VAC, the CVD is suggested at 8 percent or less of the seen portion of the landscape. By comparison, in the Modification/Intermediate VAC setting, disturbance of up to 20 percent of the seen area is suggested as acceptable. For timber harvest activities, two other guidelines besides percent of area visually affected by harvest are considered in assessing cumulative visual disturbance. One is the height to adjacent mature trees and the other is the persistence of logging slash.

For example, in areas where the VQO is met and additional activities would result in the VQO being exceeded, no additional harvest would occur. Conversely, the numerical guidelines for cumulative visual disturbance may be exceeded if the level of disturbance can occur while still meeting the VQO. For this analysis, the CVD was calculated for viewsheds where the cumulative effects appeared to approach the proposed CVD guidelines.

Viewpoints

Approximately 80 viewpoints were identified during field reconnaissance of the Project Area. The viewpoints were selected for their representative views of the major viewsheds in the Project Area. Not all viewpoints were used in the visual analysis. A subset of critical viewpoints, including Scenic Viewshed designations, Visual Priority Routes and Use Areas, developed or proposed recreation sites, permanent communities or other areas with high sensitivity levels or low sensitivity levels but high scenic quality, were selected and are used in the analysis. Some of the viewpoints were modeled with the computer program, New Perspectives, to assess visibility of proposed harvest units from a viewpoint.

The reduction process resulted in 18 photopoints (critical viewpoints) on which the analysis was based. Figure 3-29 shows the locations of the photopoints. Table 3-72 displays each photopoint with its associated visual criteria.

Figure 3-29
Map of Visual Priority Routes and Use Areas and Photopoints

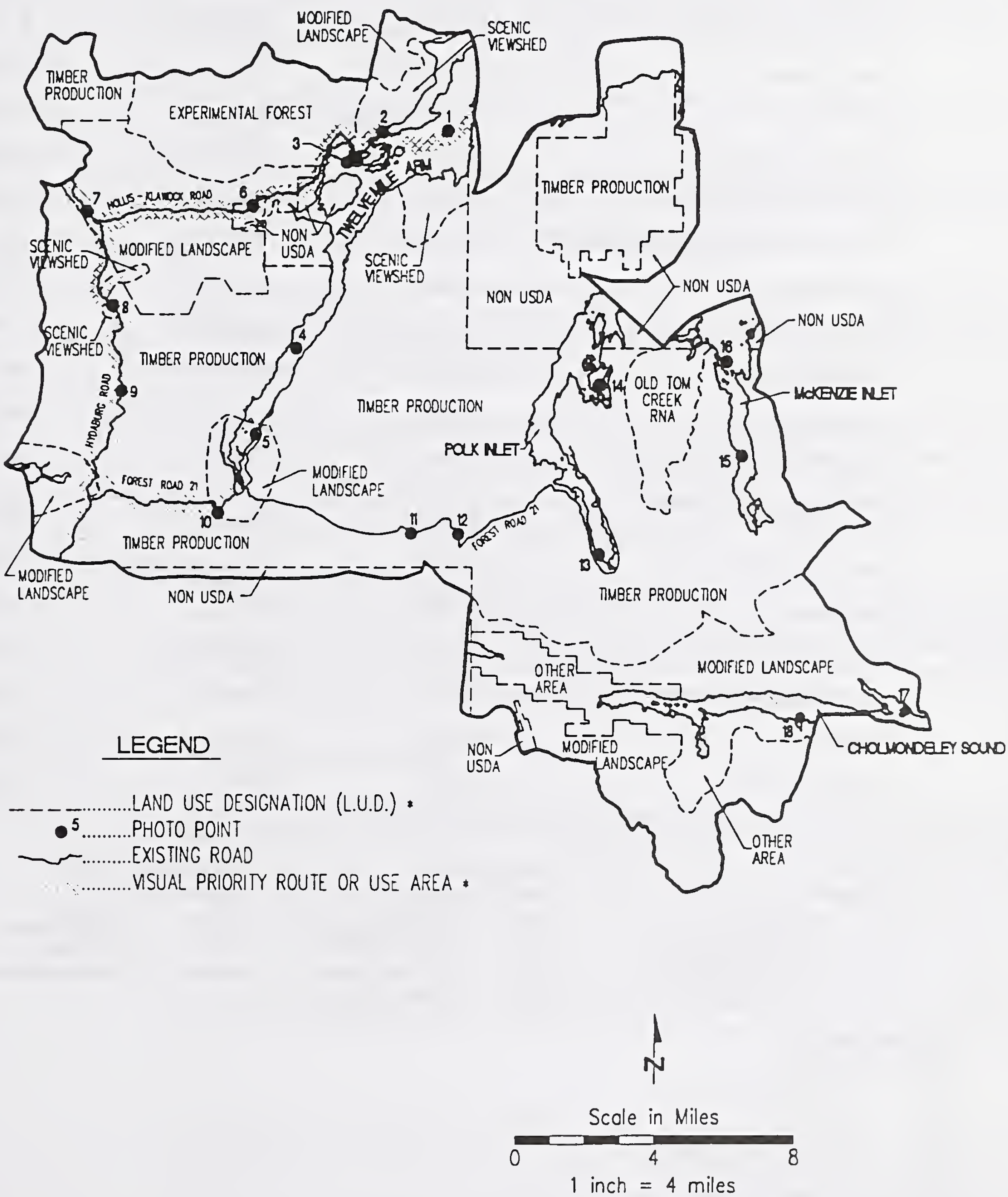


Table 3-72
Photopoints and Visual Criteria

Photo-point	Location	LUD	EVC[3/]	VQO[2/]
1	Ferry Route near Hollis	III[1/]/SV & TP[2/]	Type I & III	R, PR, MM
2	Ferry Terminal	III/SV & TP	Type I	PR, MM
3	Hollis Area	III & IV/SV & TP	Type I	PR, MM
4	Mid Twelvemile Arm	IV/TP	Type I & III	M, MM
5	Head of Twelvemile Arm	IV/ML	Type I & III	M, MM
6	Hollis-Klawock Highway Overlook	IV/ML, TP, SV	Type I & III	PR, M, MM
7	Harris Junction	IV/TP	Type I & V	MM
8*	One Duck Lake and Trailhead	IV/SV & TP	Type I & IV	R, PR, M
9*	Hydaburg Road	IV/TP	Type IV & V	M
10	Forest Road 21	IV/TP	Type IV & V	M, MM
11	Pass Lake - Forest Road 21	IV/TP	Type V	MM
12	Overlook toward Polk Inlet - Forest Road 21	IV/TP	Type I & V	M, MM
13	Head of Polk Inlet	IV/TP	Type, I, III, IV & V	MM
14	Goose Bay	IV/TP	Type I	M, MM
15	Mid McKenzie Inlet	IV/TP	Type I & IV	MM
16	Mouth of McKenzie Inlet	IV/TP	Type I	M, MM
17	Sunny Cove	III/ML	Type I	M, PR
18	Cannery Creek	III/ML	Type I	M, MM

SOURCE: McGown 1993

KEY:

Land Use Designation
III = Multiple Use [1/]
IV = Commodity Values [1/]
ML = Modified Landscape[2/]
TP = Timber Production[2/]
SV = Scenic Viewshed[2/]

Existing Visual Condition (EVC)
Type I = Untouched
Type II = Natural Appearing
Type III = Slightly Altered
Type IV = Moderately Altered
Type V = Heavily Altered
Type VI = Unacceptably Altered

Adopted Visual Quality Objective (VQO)
R = Retention
PR = Partial Retention
M = Modification
MM = Maximum Modification

1/ TLMP as amended 1986.
2/ TLMP Draft Revision 1991a.
3/ EVC and VQO Relationships:
Type I = corresponds to Preservation
Type II = corresponds to Retention
Type III = corresponds to Partial Retention
Type IV = corresponds to Modification
Type V = Maximum Modification

* Deferred due to Cumulative Visual Disturbance.

Viewshed Descriptions

The Project Area can be divided into seven major viewsheds, which are either discrete geographic areas defined by topography or major travel corridors. Large viewsheds may be at the landscape level, such as Twelvemile Arm, and can be subdivided into smaller viewsheds which are primarily seen from one or several viewpoints.

The major viewsheds include four geographic areas and three travel corridors. The four viewsheds delimited by topography are Twelvemile Arm, Polk and McKenzie Inlets and Cholmondeley Sound. The travel corridors include the Hollis-Klawock Highway, Hydaburg Road, and Forest Road 21 to Twelvemile Arm.

Several units were deferred early in the study process that mitigated potential visual effects in several key viewsheds.

The Harris River drainage, for example, exhibits significant alteration from previous harvest activities. It is also the corridor of the Hollis-Klawock Highway, one of the most traveled roads on Prince of Wales Island. Routes and Use Areas and Photopoints

Four other viewsheds were not considered for entry at this time for visual and other resource reasons. Those areas were the headlands at the mouth of Twelvemile Arm north of the Hollis ferry terminal; at the southwest end of Twelvemile Arm; in the West Arm of Cholmondeley Sound on the north shore; and, on the south shore west of Cannery Creek.

The photopoints were selected to correspond to key seen areas within the major viewsheds. A brief description of the seen area from each photopoint is provided below. Each description includes the LUD of the viewshed. VQO's are tied to the LUD's and distance zones in the TLMP Draft Revision (1991a) and are included. The EVC is included as a descriptor of the current level of alteration observed from each photopoint.

The amount of previous harvest in acres is included in Table 3-73. This is one indicator of cumulative visual disturbance. The number of seen acres in the viewshed is shown, along with the acres of second growth in the seen area, and the percent of the seen area in second growth. If the viewshed was subdivided for the analysis, the subviewshed acres and percentages are shown below the totals. This is one indicator of cumulative visual disturbance.

Twelvemile Arm Viewshed

Twelvemile Arm is a landscape level viewshed defined by the water, slopes, and ridge lines which make the arm a discrete physical and visual unit. The viewshed is subdivided into three sections for the analysis. Each section is visible primarily from one or more key viewpoints. The three sections are: 1) at the mouth, near Hollis and the ferry terminal and immediate portion of the ferry route; 2) the central section of the arm which is visible primarily from the water; and 3) the south end of the arm in the vicinity of the proposed campground and recreation cabin. Photopoints 1, 2, and 3 are in the section at the mouth of the arm. Photopoint 4 is represented by a series of viewpoints one would experience when moving through the middle part of the arm. Photopoint 5 is in the vicinity of the proposed campground at the head of the arm.

Ferry Route Near Hollis (Photopoint 1)

This is the primary saltwater travel route to Prince of Wales Island. The ferry moves at a speed of approximately 14 knots about 1 mile offshore. A panoramic view of a northern section of the Project Area and adjacent Native corporation, State, and private land is possible. Within 3 miles of the dock, the views are primarily foreground and middleground of islands, beach

Table 3-73
Seen Area, Seen Area in Second Growth, and Percent of Seen Area in Second Growth by Viewshed

Viewshed	Total Seen Area (acres)	Seen Area in Second Growth (acres)	% of Seen Area in Second Growth
Twelvemile Arm	26,395	1,837	7
Hollis Area	14,336	600	4
Central	7,975	696	9
South	4,084	541	13
Hollis-Klawock Highway Corridor	7,156	1,239	17
Harris River	6,606	1,114	17
Harris Jct.	1,550	125	8
Hydaburg Road Corridor	7,150	1,053	15
North	3,804	560	15
South	3,346	493	15
Forest Road 21	3,221	1,741	54
Polk Inlet South	7,340	1,310	18
McKenzie Inlet	7,772	812	10
North	1,460	62	4
Central	3,715	373	10
South	2,597	356	14
Cholmondeley Sound	15,143	202	1
North	5,383	3	<1
South	4,753	199	4
Sunny Cove	2,735	0	0
Cannery Creek	2,272	0	0

fringe, and steep slopes rising from the beach. The primary views to the south and west toward the Project Area are of VCU 611, most of which is in a Scenic Viewshed LUD. A portion of the view to the south is of the forested slopes in a Timber Production LUD. The headlands on both sides of the mouth of Twelvemile Arm appear to be steep, forested slopes with little alteration. To the east, extensive clearcuts on Native Corporation land are visible.

This portion of the viewshed is mostly mapped as LUD III. The VQO's, according to the amended TLMP (TLMP 1986a) should range from Retention to Modification. In the TLMP Draft Revision (TLMP 1991a), the VQO is Partial Retention for VCU 611, the Scenic Viewshed. The VQO is Maximum Modification for that portion of the viewshed in the middleground, Timber Production LUD. This discrepancy could be eliminated by adjusting the Scenic Viewshed LUD boundary to coincide with the subviewshed seen from Photopoints 1, 2, and 3.

Existing Visual Condition—The EVC is Slightly Altered (III) in a band along the inlet that varies from about one-quarter to three-quarters of a mile wide. Up slope, the EVC is Untouched (I) to the ridge line. The area mapped as Slightly Altered is due to second growth, mostly along the beach. All the second growth is at least 28 years old. In this subviewshed the second growth exhibits little visual contrast with the old-growth forest above it.

Ferry Terminal (Photopoint 2)

The views from the dock are oriented toward the water. To the east, views are toward Skowl Arm. From there, extensive clearcuts on Native corporation land are visible. To the south, the views are restricted by the forested peninsula forming Clark Bay and by Loy Island. Those two land masses create a V-shaped sight line that aims directly at the headlands on the east side of the mouth of Twelvemile Arm. The headlands are the view terminus from here. To the west, the views are of the enclosure of Clark Bay. To the north, views are of the parking area and terminal building backed by a steep slope which constricts views to the foreground.

The VQO's are the same as for Photopoint 1.

Existing Visual Condition—The EVC on National Forest System land is Slightly Altered (III) along the shoreline across Twelvemile Arm from the terminal, and Untouched (I) on the slopes above the ridge line.

The description from Photopoint 1 applies.

Hollis Area (Photopoint 3)

Hollis does not have well-defined community boundaries. Views were checked from the ferry terminal west along community roads to a seaplane base and boat launch in Hollis Anchorage. The views toward the Project Area are restricted by topography and vegetation. From the water and shoreline near this viewpoint, a funneled sight line through the entrance to Hollis anchorage is directed at the forested headlands on the east side of the mouth of Twelvemile Arm which are in the middleground distance.

The view from this photopoint currently meets a VQO of Retention. The VQO is Modification and Maximum Modification for the foreground and middleground Timber Production LUD under the TLMP Draft Revision (1991a). If Hollis is designated as a visual priority area, then the VQO should be reconsidered and probably should at least meet Modification. Moving the Scenic Viewshed boundary south to include this portion of the viewed landscape would address this issue as the VQO would become Modification.

Existing Visual Condition—The EVC is Slightly Altered (III) along the shoreline across Twelvemile Arm from the terminal, and Untouched (I) on the slopes above. The EVC description is the same as for Photopoint 1.

Mid-Twelvemile Arm (Photopoint 4)

The middle section of Twelvemile Arm currently is visible only from the water or air. From viewpoints midway in Twelvemile Arm, the landscape appears mostly undisturbed. The second growth on the west side of the inlet is 30 or more years old. The second-growth is on the lower slopes and blends with the old growth. On the east side of the head of the inlet 30-year-old cuts on the lower slope are barely noticeable. Several cuts from the early 1970's on the steeper, higher slopes have not regenerated as well and are obvious from the middle of the inlet. An LTF is obvious at the end of the road as is an abandoned facility, which appears as a fill from the water. Looking north and west from the end of the road and from the water, the landscape appears to be undisturbed old-growth forest above the beach fringe. It is difficult to locate one static viewpoint in this subdivision of the Twelvemile Arm viewshed. Most viewers would be moving through the area on a boat, experiencing ever-changing views of the beach fringe, slopes, ridges, and landmarks.

Currently, VQO's of Retention to Partial Retention would be met. The draft VQO's are Modification for foreground and Maximum Modification for middleground.

Existing Visual Condition—Part of the middle section of the inlet is old-growth forest in an Untouched (I) condition. The Untouched condition is on the slopes above the Slightly Altered (III) band along the shoreline on the east. On the west where there was previous harvest activity along the salt water, the EVC is Slightly Altered (III) from the head of the inlet to approximately even with the photopoint. North of the photopoint on the west side of the inlet, the EVC is Untouched (I) from the shoreline to the ridge line.

Head of Twelvemile Arm (Photopoint 5)

The existing road, which extends approximately 2 miles along the east side of the head of Twelvemile Arm, provides ready access to the inlet and numerous opportunities to view the estuary and west side of the inlet. Two proposed recreational developments, a recreation cabin at the head of the inlet and a campground about 1 mile north of the proposed cabin, will establish two specific viewpoints in the future. The list of Forest Service defined use areas limits the viewshed to an area "directly across from the site of the campground." It does not mention a narrowly defined viewshed for the proposed recreation cabin. The views from these two points are relatively enclosed by the topography and vegetation. The estuary is a focal area both from land and water viewpoints. Previous harvest areas are more visible from the inlet than from the road or proposed recreation sites.

Existing Visual Condition—The EVC's at the head of the inlet are Heavily Modified (V) along the east side and Slightly Altered (III) along the west side. The alterations on the east side resulted from extensive cutting in 1960 and into the mid-1970's. An old log transfer site that includes a rock fill area at the shoreline and at least one staging area are other visible alterations both from the road and from the water. Moving north, the EVC changes to Slightly Altered (III) along the inlet, and Untouched (I) on the slopes to the ridge lines. The current conditions would meet VQO's of Partial Retention to Modification. Draft VQO's are Partial Retention for the foreground and modification for middleground views in the Modified Landscape LUD at the head of the Arm. The draft VQO's are Modification and Maximum Modification for foreground and middleground Timber Production LUD.

Hollis-Klawock Highway Corridor Viewshed

The Hollis-Klawock Highway roughly parallels the Harris River; consequently, the visual experience is one of being in a valley. The road often is vertically and horizontally removed from the river, so some of the views are long distance across the drainage or along the road corridor. Most units within the corridor were deferred from this entry. The two viewpoints selected for photopoints in the analysis are from locations where harvest activities would be visible from the corridor. The view corridor is mostly defined by the ridge lines on the north and south of the Harris River.

Hollis-Klawock Highway Overlook (Photopoint 6)

The view from this photopoint is one of the most panoramic from any of the priority travel routes in the Project Area. The elevated viewpoint overlooks the Harris River drainage and estuary and part of Twelvemile Arm. Approximately 8 miles of ridge line and slopes along the eastern side of Twelvemile Arm are visible from this photopoint and form the view terminus in the background distance zone. Long distance and panoramic views are not common from the priority travel routes. This view is also uncommon as no clearcuts are visible.

The view from this photopoint currently meets a Retention VQO. The draft VQO's are Partial Retention for foreground and Modification for middleground in the Modified Landscape LUD along the highway corridor which also is a Visual Priority Route. However, the draft VQO is Maximum Modification for the Timber Production LUD on the slopes and ridges above Twelvemile Arm.

Existing Visual Conditions—The EVC is Slightly Altered (III) along the shoreline across Twelvemile Arm, and Untouched (I) on the slopes above. The slopes are the largest portion of viewed area.

Harris Junction (Photopoint 7)

This slightly elevated viewpoint about one-half mile west of the intersection of the Hollis-Klawock Highway and Hydaburg Road is a relatively small viewshed directed over a small drainage roughly parallel to the highway, ending at a high point in the near middleground. This is a major road intersection in the Project Area and is eventually slated for community and recreation development. Visually it is part of the Hollis-Klawock Highway corridor. The TLMP as amended in 1986 adopted VQO's of Retention to Modification for corridors along the main line roads. Current conditions meet a Partial Retention to Modification VQO.

The draft VQO's are mapped as Maximum Modification for this middleground view in a Timber Production LUD. This could be addressed by moving the Modified Landscape LUD boundary to the first ridge south of the road, to include this road intersection view corridor and by managing according to the Modified Landscape VQO's.

Existing Visual Condition—The EVC is Untouched (I) on the south slopes visible from the photopoint. Between the road and the hills to the south, the EVC previously was mapped as Heavily Altered (V). The second growth, which is now about 30 years old, has grown sufficiently to change the EVC to a Moderately (IV) Altered condition.

Hydaburg Road Corridor Viewshed

The Hydaburg Road view corridor is more variable than the Hollis-Klawock Highway corridor as the road does not parallel one drainage for most of its length. Two segments of the corridor were identifiable as subviewsheds, North and South, based on topography, landmarks, and sight lines. Most of the corridor through the Project Area exhibits alteration. Second growth of varying ages is visible from the road as well as clearcuts less than 10 years old. Numerous rock pits are along the road.

The two photopoints on this road include units which were mapped in areas of high sensitivity or areas of substantial alteration. They have been deferred from this entry, but are described to establish the visual baseline and considerations for this project.

One Duck Lake and Trailhead (Photopoint 8)

A harvest unit proposed between the two small scenic viewshed LUD's at the lake and trailhead was deferred. The proposed unit, adjacent to a 1987 cut, would have exceeded the suggested cumulative visual disturbance level of 15 percent for a foreground viewshed with Low VAC and Modification VQO. The proximity of the two, tightly defined scenic viewsheds indicates a high level of viewer sensitivity in this area. The road corridor that defines this viewshed is approximately 1 mile in length.

The VQO's are Retention for the foreground and Scenic Viewshed and Modification for the Timber Production land use designation.

Existing Visual Condition—The area around One Duck Lake is Untouched (I). At the south end of the viewshed in the vicinity of the 1987 cut, the EVC is Moderately Altered (IV).

One Duck Trail

Hydaburg Road—4.5 miles south of Harris Junction (Photopoint 9)
The corridor of this portion of the subviewshed extends about 1.5 miles along a fairly straight segment of road, beginning about 4.5 miles south of the Harris Junction (intersection of Hollis-Klawock Highway and Hydaburg Road). Proposed harvest in this part of the road corridor was deferred because of cumulative visual disturbance. About 33 percent of the viewshed would have been affected with additional harvest.

It has been affected by harvesting in 1981 and 1987, with most of the harvest units adjacent to the road. The VQO of Modification appears to have been exceeded under current conditions. The standards and guidelines suggest a limit of 15 percent cumulative visual disturbance for areas of low VAC with Modification VQO.

Existing Visual Condition—This stretch of road corridor has an EVC of Moderately Altered (IV).

Forest Road 21 Corridor Viewshed

Forest Road 21 is a Visual Priority Route from the Hydaburg Road to Twelvemile Arm. The road follows two drainages, crossing from one to another at a watershed divide about half way between the Hydaburg Road and Twelvemile Arm. The road is bounded on the south by generally steeper slopes. For most of the corridor, the views are confined by topography and/or foreground vegetation.

There is a high level of disturbance within the corridor due to previous harvest and road building, especially rock pits. Extensive harvest occurred along the road, most of it 30 or more years ago. Several harvest units are scheduled to occur about half way through the corridor in 1993.

Though the corridor is a designated Visual Priority Route, it is not especially scenic in part because of the enclosure and lack of diversity. Visual enhancement opportunities exist along Forest Road 21.

Forest Road 21 (Photopoint 10)

This photopoint marks the first long distance view toward the head of Twelvemile Arm. One can see over the drainages flowing into the inlet and to the slopes that form the head of the fjord. From this vantage point, 4.2 miles east of the Hydaburg Road, the second-growth is more than 30 years old in the foreground landscape. The older second growth is tall enough to provide foreground screening so that the extent of previous harvest is not readily visible from the road. The adopted VQO of Maximum Modification is met under the existing conditions. In the middleground and background, about five earlier cuts are visible. In the older cuts, alders have filled in logging roads and skid lines creating contrast in color and texture.

Existing Visual Condition—The EVC's are Moderately (IV) and Heavily (V) Altered in the vicinity of the proposed units. The EVC reflects the amount of harvesting that was done in 1958, 1960, 1966, and units that will be cut by 1995.

Forest Road 21 Corridor

Forest Road 21 beyond Twelvemile Arm is not a designated Visual Priority Route. In the Forest Service database, the entire area is mapped as "Not Seen," meaning it has a Sensitivity Level of 3 and that the draft VQO's are all Maximum Modification. Since all National Forest System lands must meet at least Maximum Modification, several photopoints were selected for analysis in the areas mapped as Not Seen. Refer to Figure 3-28 for photopoint locations.

Forest Road 21—Pass Lake (Photopoint 11)

This viewshed is over a small basin with a lake. The area is aesthetically pleasing. A pull out above the lake indicates it may have some recreational use although it is not listed as a recreation place. The road curves around the lake. A roadside unit at the outside of the curve was deferred. The slopes behind the lake recently have been harvested.

The draft VQO is Maximum Modification for all distance zones as this area is considered Not Seen.

Existing Visual Condition—The EVC for this viewshed is Heavily Altered (V). Substantial clearcutting has occurred in this area as recently as 1988.

Forest Road 21—Overlook Toward Polk Inlet (Photopoint 12)

This photopoint, 13.5 miles from Hydaburg Road on Forest Road 21, documents the view from one of the few long-distance panoramas on travel routes in the Project Area. The summer view terminates at a mountain with patches of snow and brilliant green alpine vegetation. It is not on the list of Visual Priority Routes. It was selected as a viewpoint during field work based on the scarcity of long-distance views and the extent of visual disturbance in the viewshed.

The VQO for this Timber Production area for all distance zones in the area is mapped as Not Seen.

The heavily altered nature of the landscape is due primarily to a number of harvest units from the late 1980's and early 1990's. From this photopoint, all distance zones show evidence of alteration. This viewshed is heavily altered visually, but does not exceed the suggested Forest Plan guideline of 50 percent alteration. Additional harvest in this viewshed in this decade arguably would result in unacceptable modification.

Existing Visual Condition—Between the viewer position and the view terminus, most of the landscape is Heavily Altered (V). The view terminus is a snow-capped, alpine peak on the east side of Polk Inlet. The EVC of the seen area on the east side of the inlet is Untouched (I). A portion of the background is in a Slightly Altered (III) condition.

Polk Inlet Viewshed

Polk Inlet, like Twelvemile Arm, is a discrete geographical unit which also is a landscape level viewshed. The inlet is oriented roughly north-south, with a dogleg roughly half way through the inlet. The steep side slopes terminate in ridges approximately 2,000 feet above the water. The ridges form the view terminus along the sides of the inlet. At the southern end of the inlet, the views open up over an estuary and flatter alluvial slopes where several drainages flow into the inlet. The drainages are visible, rising to the south, to a summer view of background mountains with bright green alpine vegetation and snow fields.

The inlet is divided into two main subsections by the dogleg bend. The portion toward the head of the inlet shows little evidence of alteration compared to the segment toward the mouth of the inlet. The entire inlet is mapped as Sensitivity Level 3, and "Not Seen." Two viewing areas were selected for analysis, one toward the scenic head of the inlet where a potential campground is located, and one toward the mouth in a bay designated as an anchorage and Visual Priority Use Area.

Head of Polk Inlet (Photopoint 13)

There are two viewsheds at the head of Polk Inlet, one from the water and one from the road that wraps around the inlet. From the water, the views are over an estuary and meadow in the foreground. A forested flat area—site of a proposed campground—is backed by scenic views of Rock Butte and snow topped Barren Peak. The Rock Creek and Polk Creek drainages are evident and contribute to the landscape diversity seen from this vantage point. The tops of several recent harvest units are visible up Polk Creek drainage. To the west, nearly 40-year-old second growth has created fairly uniform-appearing tree canopy with surrounding old growth. High on the west slope above the photopoint, a new clearcut is evident. The draft VQO is Maximum Modification. The entire area considered in this photopoint is mapped as not seen. Current conditions would meet Retention to Partial Retention VQO's from the inlet viewpoint and a Modification VQO from the road. This is one of the few areas in the Project Area with a variety Class A designation, which indicates a high level of scenic quality.

Along the road, the viewshed is enclosed by the forest and topography. Viewing scenery is a recreational activity listed for this area. Rock Creek is a clear, cascading stream as it flows under the bridge and toward the inlet. From the road around the inlet, foreground vegetation screens and encloses views. The most evident alterations are a rock quarry, road cuts and fills, and some tree thinning along the roads. The inlet is not visible from the road. Framed views of Rock Butte occur along the road.

Existing Visual Condition—The EVC's for this area range from Untouched (I) on the eastern end of the inlet, to Slightly Altered (III), to Moderately Altered (IV), to Heavily Altered (V), moving clockwise around the end of the inlet, ending on the west side.

Goose Bay (Photopoint 14)

The enclosed viewshed of Goose Bay is in VCU 619. This area is listed as an anchorage among the Forest Service recreation places, and it is a designated Visual Priority Use Area (see Figure 3-29). The convoluted shoreline of the peninsula and islands gives a feeling of enclosure. The calm water, shallow in much of the bay, provides a different visual and experiential opportunity than the inlet. The low hills enclose the views in most directions.

Existing Visual Condition—The viewshed into Goose Bay is predominantly Untouched (I). The top margin of a clearcut from 1990 is visible in the southeast portion of the viewshed, where the EVC is Moderately Altered (IV). The only other visual disturbance is to the west, across Polk Inlet. The several-hundred-acre clearcut on non-National Forest System land is visible from the entrance to the bay.

McKenzie Inlet Viewshed

McKenzie Inlet is the smallest of the four major inlets in the Project Area and provides the most intimate visual experience. The inlet is almost straight north and south for its entire length. The side slopes are very steep. The narrowness of the inlet and the steepness of the slopes constrict views so that the ridge lines are not always visible from the middle of the inlet.

The inlet was subdivided into three subviewsheds: north around the mouth of the inlet, central, and south. The entire inlet is mapped as Sensitivity Level 3, "Not Seen," indicating it will not be managed primarily for the visual resource. Two viewpoints, one in the central part of the inlet and one at the mouth, were selected as photopoints for analysis. The unaltered condition of the inlet will change with the harvest that is scheduled to occur by 1994. A baseline must be established to assess cumulative effects. Also, the steepness of the slopes and the narrowness of the inlet will make it more difficult to stay within the VQO of Maximum Modification, which is the draft VQO for the entire interior portion of the inlet.

Mid-McKenzie Inlet (Photopoint 15)

McKenzie Inlet units all are in VCU 618. This inlet is narrower and straighter than Polk Inlet or Twelvemile Arm. The slopes of this fjord are steep, with cliffs and rock outcrops evident in some of the higher reaches. Landslide scars emphasize the steepness and instability of some soils. The light soil of the slides contrasts with the dark green forest. Currently the inlet appears unaltered. Seals and eagles were present during the field visit.

The draft VQO is Maximum Modification for all distance zones. Summer 1992 conditions would meet a Retention VQO in the inlet. McKenzie Inlet is mapped as Not Seen for its entire length.

Existing Visual Condition—The EVC is predominantly Untouched (I), with an area of Moderate Alteration (IV) on the east side of the inlet, just south of the photopoint. The area of Moderate Alteration includes second growth from the late 1950's as well as two cuts slated for 1993. Proposed harvest units and roads will change the EVC, probably to Type IV, before this EIS is implemented.

Mouth of McKenzie Inlet (Photopoint 16)

The mouth of McKenzie Inlet is guarded by the two Sentinel Islands, which also screen views of the lower slopes at the inlet mouth. The steep side slopes of the inlet tend to funnel views down the inlet or to sweep upward to the ridge lines. Landscape features such as incised drainages and rock outcrops are more visible along the slopes of McKenzie Inlet than in Twelvemile Arm or Polk Inlet. The narrow, steep-sided inlet provides an intimate visual experience due to the sense of enclosure.

The draft VQO's are modification for a sliver of middleground at the northwest end of the inlet and Maximum Modification for the rest of the area which is mapped as Not Seen.

Existing Visual Condition—The EVC is predominantly Untouched (I), with a narrow strip of Slightly Altered (III) along the west side of the mouth of the inlet. Two small, not obvious, cuts from the late 1980's have resulted in the altered condition.

West Arm Cholmondeley Sound Viewshed

The West Arm of Cholmondeley Sound is a large, landscape level viewshed that can be subdivided by topography into component viewsheds. Unlike the other inlets in the Project Area, Cholmondeley Sound is oriented east and west, with its mouth opening to the east. The subviewsheds are: Sunny Cove; the north side of the West Arm west of Sunny Cove; Cannery Creek; and the south side of the West Arm west of Cannery Creek.

The West Arm is largely unaltered. Small signs of human habitation are the only alteration. The steep side slopes are interrupted by small coves and a bay around the Big Creek estuary. The majority of the south Cholmondeley Sound and part of the north Cholmondeley Sound viewsheds have been selected by Native corporations. Once the lands are conveyed, it is likely substantial timber harvest would occur in the West Arm of Cholmondeley Sound. Anticipating cumulative visual impacts on the order of what is observed in Dora Bay, to the east, all units at the west end of the West Arm were deferred from this entry; consequently, no viewpoints west of Cannery Creek were selected for analysis. The two photopoints selected for analysis are at the east end of the West Arm in the two coves which have present day residents on private land.

Sunny Cove (Photopoint 17)

Sunny Cove extends northwest to southeast, with the east end open to Cholmondeley Sound. The Sunny Cove viewshed is bounded by low hills on the north. The cove extends north westward where the Sunny Creek drainage appears as a U-shaped valley largely screened from view by topography and forest cover. The water at the west end of the cove is shallow, limiting access to craft with low draft. Several docks, lawns, and cabins are barely visible near the shoreline on the north side of the cove where there are several parcels of private land.

The draft VQO's for the middleground, Modified Landscape designation is Modification. Foreground activities need to meet a Partial Retention VQO. Current conditions meet both objectives as the small-scale, mostly hidden signs of human habitation are unobtrusive.

Existing Visual Condition—The EVC is Untouched (I) for Forest Service land.

Cholmondeley (Cannery) Creek (Photopoint 18)
This small cove is south of Sunny Cove, across Cholmondeley Sound. Pilings from a former pier march along the beach fringe. One building is visible on the beach and two cabins can be glimpsed through the trees. Private land wraps around the small cove. To the south, the viewshed is bounded by low hills in the foreground. The Cannery Creek drainage rises to the south where the horizon is created in the middleground by rounded, forested hills.

The draft VQO's are Modification for the middleground and Partial Retention for the foreground.

Existing Visual Condition—Views to the south include signs of human habitation, past and present, but the forest behind the private land is Untouched (I). To the west and north in Cholmondeley Sound, the landscape is also Untouched (I). To the east, there are vast clearcuts on non-National Forest land.

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Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas

Key Terms

Developed recreation—that type of recreation that occurs where more facilities and amenities are incorporated into a site to accommodate intensive recreation activities in a defined area.

Dispersed recreation—that type of recreation use that requires few, if any, improvements or specific developed sites, and may occur over a wide area. This type of recreation involves activities related to roads, trails, and undeveloped waterways and beaches.

Recreation Opportunity Spectrum (ROS)—a system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs.

Recreation place—an identified geographic area having one or more physical characteristics that are particularly attractive to people engaging in recreation activities; can contain from zero to several recreation sites.

Recreation site—specific location or site where recreational activities occur and/or a recreational facility is located; smaller in area than a recreation place.

Recreation Visitor Day (RVD)—a measure of recreation use of an area. One recreation visitor day consists of recreation use of a site or area by one person for 12 hours; can be abbreviated as "visitor day."

Roadless area—an area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Service Day—a day or any part of a day for each individual or client accompanied or provided services, including transportation services, by an outfitter or guide.

Wild and Scenic River—rivers or sections of rivers designated by congressional action under the 1968 Wild and Scenic Rivers Act or by an act of the Legislature of the state or states through which they flow.

Wilderness—areas designated by congressional action under the 1964 Wilderness Act or by TTRA and/or ANILCA; undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation.

Introduction

Prince of Wales Island plays an important role in Southeast Alaska by providing settings for various types of outdoor recreation. Typical Southeast Alaskan recreational activities such as viewing scenery, boating, fishing, hunting, and hiking occur throughout Prince of Wales Island. Unlike most of Southeast Alaska, however, Prince of Wales has an extensive road system, primarily as a result of the timber industry. Approximately 1,100 to 1,200 miles of road are open to the general public, and as a result, many popular recreation areas on Prince of Wales can be accessed by car.

Most of Prince of Wales is contained in one of the two Tongass National Forest Ranger Districts on the island. The Craig and Thorne Bay Districts contain virtually all of the island's public recreational facilities, and include over 20 recreation cabins and shelters, 5 developed campgrounds, 4 developed picnic areas, and approximately 20 miles of maintained trails. The Project Area is located in the Craig District in the southeast section of Prince of Wales. Much of the Project Area has seen limited timber harvest activities, and is not as accessible by road as many other parts of the island.

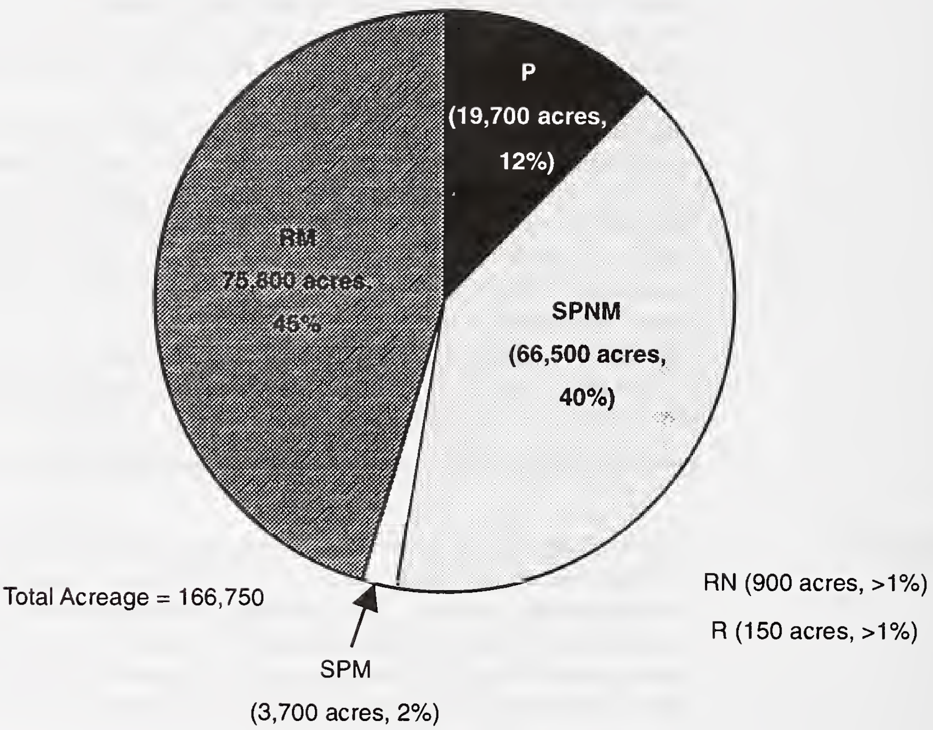
Recreation Opportunity Spectrum (ROS)

The ROS system was developed by the Forest Service to help identify, quantify, and describe the variety of recreation settings available in National Forests. The ROS system is not a land management system, but rather is a method used to inventory an area's potential recreational opportunities. The ROS system can be used to evaluate the changes in recreational opportunities that can occur in a given area as a result of different management prescriptions. The ROS system classifies an area into one of six recreation settings that range from very primitive to highly developed.

The ROS settings are based upon a number of different criteria such as: remoteness, landscape character, human use, and amount of human modification (Greenig 1993). All six of the ROS settings are found within the Project Area and range from settings that are remote, pristine, and primitive, to settings that have been highly modified by human activity. The six ROS settings found in the Project Area are, in order of disturbance from least to most, Primitive (P), Semi-Primitive Non-Motorized (SPNM), Semi-Primitive Motorized (SPM), Roaded Natural (RN), Roaded Modified (RM), and Rural (R). The distribution of ROS settings in the Project Area is illustrated in Figure 3-30.

Figure 3-30

Existing Project Area Recreational Opportunity Spectrum (ROS) Settings by Acreage and as a Percentage of the Project Area 1/



SOURCE: Forest Service 1992c.

1/ Numbers rounded off to nearest 100 acres. Total acreage = 166,750.

Note:
- R = Roaded
- RN = Roaded Natural
- RM = Roaded Modified
- SPNM = Semi-Primitive Non-Motorized
- SPM = Semi-Primitive Motorized
- P = Primitive (unmodified natural environment)

The current status of the various ROS settings found in the Project Area is continually changing as timber harvest activities from the 1989-94 operating period proceed. In describing the "existing" ROS settings, it has been assumed that all the proposed harvest units scheduled to be cut as a result of the 1989-94 EIS will be cut. The description of the existing conditions then, is based upon what the Project Area's ROS settings would be upon completion of the 1989-1994 EIS timber harvest.

Virtually all (98 percent) of the Project Area is included within four ROS settings: RM, SPNM, and P (Figures 3-30 and 3-31). With approximately 75,800 acres, the RM setting is the most extensive, accounting for 45 percent of the total Project Area. These RM settings are generally found where timber management activities have occurred, such as in the Hollis-Klawock Highway corridor, the Hydaburg Road corridor, a large area from east of Trocadero Bay to the southern end of Twelvemile Arm, and an area surrounding the southern half and eastern shore of Polk Inlet. The RM setting contains the largest number (15 existing and 11 potential) of recreation sites of any of the settings found in the Project Area.

The ROS setting with the second greatest amount of area in the Project Area is SPNM. The 66,500 acres of SPNM accounts for 40 percent of the Project Area. Significant areas of SPNM include an area north of the Hollis-Klawock Highway, areas on either side of the RM setting located along the Hydaburg Road corridor, a section including the east side of Twelvemile Arm and continuing around and south of Upper Franks Lake, an area west of McKenzie Inlet that includes the Old Tom Creek Research Natural Area, and several areas south of Polk and McKenzie inlets. There are 5 potential recreation sites and 1 existing site in the SPNM setting.

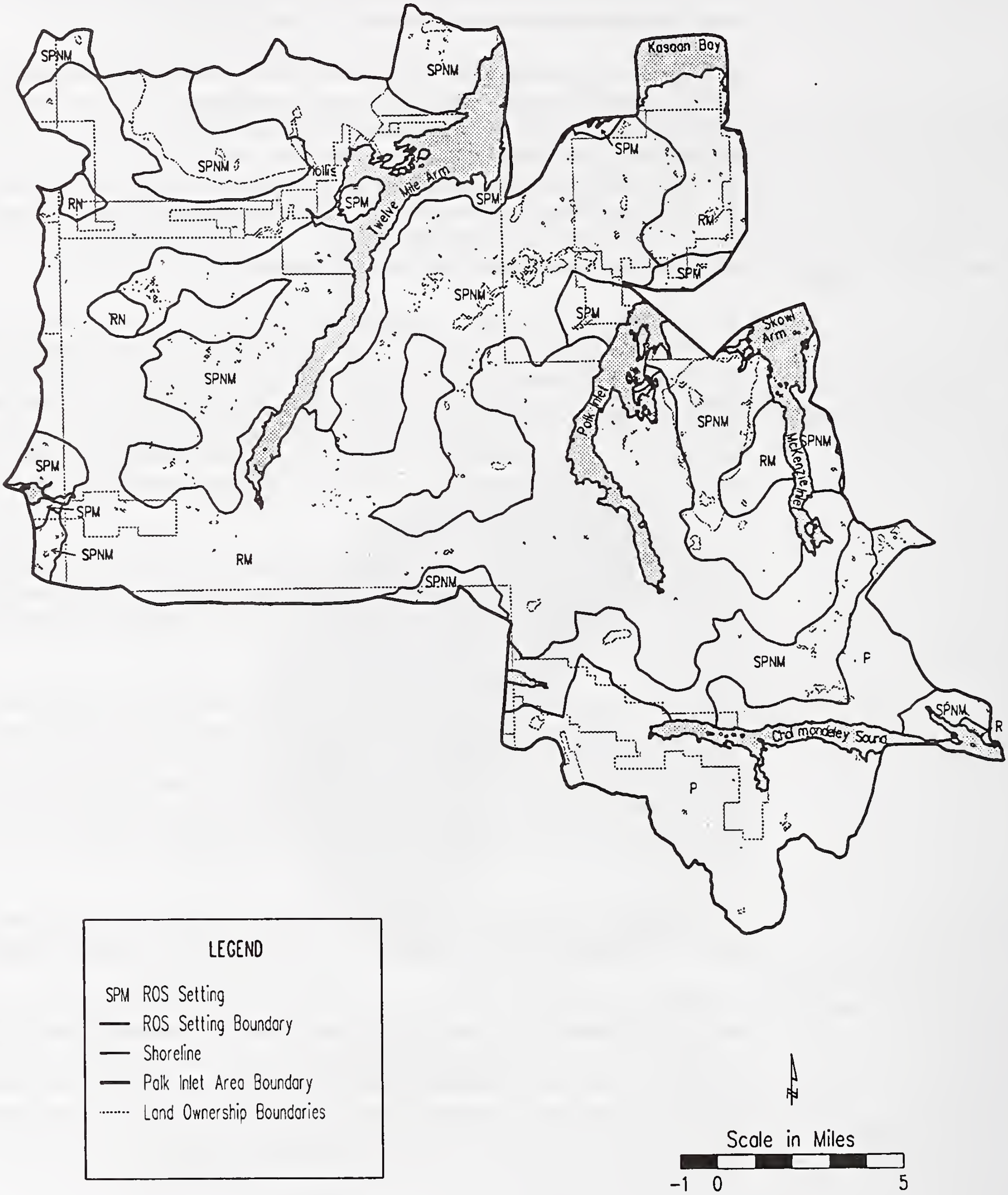
Primitive (P) settings are concentrated in the southern part of the Project Area and create a continuous band of P that surrounds most of Cholmondeley Sound. The P setting accounts for 19,700 acres or 12 percent of the Project Area. Three potential recreation sites and 1 existing site are found in the P setting.

The SPM settings within the Project Area are located adjacent to the north and west shore of Polk Inlet and along the upper east and west shore of shore of Twelvemile Arm. The SPM settings total approximately 3,700 acres, which accounts for less than 2 percent of the Project Area. The largest number (17) of existing and potential Forest Service recreation sites occur in the ROS setting of RM (Figure 3-30). Most of the sites are, or would be, accessible by road or are located near roads. Two existing recreation sites are located in the ROS setting of SPM.

The roaded natural setting consists of less than 900 acres. One existing and one potential site (both near One Duck Lake) are located in a RN setting and are adjacent to a major road.

As timber harvest moves the Project Area towards the TLMP desired future condition, ROS settings will continued to change. Future timber sales will continue to result in the alteration of lands within the Project Area and thus ROS settings. Harvest activities will continue to reduce the amount of P, SPNM, and SPM ROS settings, and increase in the amount of RM. When the desired future condition is reached, the ROS setting for the entire Project Area will be RM with the exception of the Old Tom Creek Research Natural Area, which will remain SPNM.

Figure 3-31
Recreational Opportunity Spectrum (ROS) Settings*



SOURCE: Forest Service, Ketchikan Area, database.

* At completion of 1989-94 Operating Period harvest.

Recreation Places and Recreation Sites

Recreation places are geographic areas identified by the Forest Service as having characteris tics that are, or are potentially, attractive to people engaging in recreational activities. They may or may not contain recreation sites, or may be areas within which widely dispersed recreational activities take place. The boundary of a recreation place is established based upon the geographic area needed to establish the characteristics, settings, and experiences that are important for the site or activity.

Within recreation places are recreation sites, which are specific existing or potential locations identified by the Forest Service as having recreational value. A recreation site may (1) have developed facilities such as a campground or cabin, (2) have potential for such a facility, (3) be an undeveloped use area, or (4) be a natural attraction conducive to specific activities such as anchoring a boat or fishing.

The effects of timber harvest activities on recreation described in this EIS relate primarily to the effects harvest would have on specific recreation sites. Because site- specific analysis also generally addresses the effects of timber harvest on the recreation places in which the recreation sites are usually located, the focus of this EIS is on recreation sites. Two recreation places, however, are examined—Old Franks Creek and Cholmondeley Sound. These recreation places are included in the analysis because no specific recreation sites have yet been identified in the Old Franks Creek area or in Cholmondeley Sound where widely dispersed boating and kayaking are the most important recreational activities.

Most of the existing recreational sites are not developed facilities, but rather are sites for dispersed recreation, such as observation areas and anchorages. The 20 existing and 21 potential recreation sites identified in the Project Area, as well as the two recreation areas, are described in Table 3-74. Figure 3-32 shows the geographic location of the recreation sites. Specific recreation sites and places found within each VCU are discussed under Recreational Resources by VCU.

Existing Activities and Use Patterns

The Project Area contains settings for most of the outdoor recreation activities popular in Southeast Alaska. The Craig Ranger District's annual estimate of recreational use within the Craig District indicates that the five most popular activities within the district are: viewing scenery, automobile travel, motor boating, saltwater fishing, and big game hunting. Participation in all of the activities occurs in the Project Area, although the extent is difficult to determine. The popularity of viewing scenery and automobile travel in the Craig District could probably be attributed to the extensive road system in the district.

Although there are no use figures available for determining the amount of recreation use that occurs within the Project Area, the Craig Ranger District annually estimates participation in various activities. By examining the estimated district-wide use figures, the relative popularity of existing activities can be determined, and inferences drawn as to activities popular in the Project Area. Estimates of current recreation activity, however, do not take into account activities that could potentially occur in an area if there were facilities to accommodate those activities.

An estimated 142,000 recreation visitor days occurred within the district during 1991 (Table 3-75). The three most popular activities identified by the Craig District (viewing scenery, automobile travel, and power boating) combined for an estimated recreation visitor day total in 1991 of 90,000, and accounted for almost two-thirds of all the identified primary recreational activities in the district. Saltwater fishing and big game hunting were the fourth and fifth most popular activities and were the most popular harvesting activities. They accounted for an estimated 20,000 recreation days.

The following sections discuss the more popular recreational activities that occur within the Project Area.

Table 3-74
Existing and Potential Recreation Sites and Recreation Places

VCU	ROS Setting	USFS Recreation Site Number	Existing (E) Potential (P)	Notes
Recreation Sites				
611	RM	51100	E	Informational signage near ferry terminal
612	None			
613	SPNM	A	P	Old Franks Creek Trail
618	RM	51112	E	Anchorage near end of McKenzie Inlet
	RM	51113	P	Dispersed campsite at end of McKenzie Inlet
619	RM	51109	E	Anchorage near Goose Bay
	RM	51110	E	Observation Site in Goose Bay - outstanding scenery consisting of small islands, inlets and passages
	SPM	51111	E	Observation Site between Goose Bay and Connection Pass - outstanding scenery consisting of many small islands, inlets and passages
620	SPNM	51101	P	Potential shelter site
	SPNM	51102	P	Observation Site near unnamed lake in mountains west of Polk Inlet
	RM	51103	P	Picnic site near logging road and Pass Lake
	RM	51104	E	Observation Site - Dog Salmon Lake area
	SPNM	51105	P	Observation Site - Rock Lake area
	RM	51106	P	Family campground near end of Polk Inlet
	RM	51107	E	Observation Site - end of Polk Inlet views of shoreline, estuary, inlet and mountains
	RM	51108	P	Boating site on west side of Polk Inlet
	RM	51260	E	Observation Site on west side of Polk Inlet near Forest Service facility
	RM	51261	P	Boating site near recreation site 51260
	RM	B	E	Dog Salmon Creek fish pass and interpretive area
621	RM	51056	P[1/]	Family campground on east side of Twelvemile Inlet, approximately 1 mile north of end of inlet
	RM	51057	P[1/]	Recreation Cabin on east side of Twelvemile Inlet, near end of inlet
	RM	51295	P	Potential boating site
622	RM	51052	E	Hollis public float and ramp
	RN	51054	P	Family picnic area near One Duck Lake
	RN	51055	E & P	One Duck Trail trailhead (Forest Service Trail No. 736), possibly extend One Duck Trail 6 miles in future
	RM	51051	P[1/]	Maybeso Campground - location not identified, but would be in Harris River drainage
	SPNM	51272	E	One Duck shelter
	RM	51290	P[1/]	Family picnic area near Harris River
	RM	51291	E	Observation area near 51290 along Harris River (state selected land)
	RM	51292	E	Harris River Trail trailhead (Forest Service Trail No. 775)

Table 3-74 (continued)

Existing and Potential Recreation Sites and Recreation Places

	ROS Setting	USFS Recreation Site Number	Existing (E) Potential (P)	Notes
622 (continued)				
	RM	51293	E	Twentymile Spur Trail trailhead (Forest Service Trail No. 734)
	RM	C	E	Pullover and overlook of Harris River Bay, Indian Creek drainage, nearby mountains, located on south side Hollis-Klawock Highway
	RM	D	E	Harris footbridge facility - dispersed day use recreation area near abandoned bridge abutment over the Harris River
624	RM	51058	P	Family picnic area along Forest Road 21 near small lakes in Cable Creek Habitat Area
	RM	51265	E	Interpretive sign and facilities at Cable Creek fish pass
	SPM	E	E	Trocadero Bay Trail trailhead (Forest Service Trail No. 737)
674	SPNM	51155	P	Recreation shelter at east end of Hetta Inlet on west side of Sulzer Portage (Haida Corp. select land)
	P	51156	P	Recreation cabin at east end of West Arm of Cholmondeley Sound at east end of Sulzer Portage (Haida Corp. select land)
	P	51157	P	Dispersed campsite on south shore of West Arm approximately 1 mile from end of inlet (Haida Corp. select land)
	P	51158	E	Anchorage on north side of West Arm approximately 1 mile from end of inlet
	P & SPNM	F	P2/	Sulzer Portage Trail
675	None			
Recreation Places				
613	SPNM	Old Franks Creek Area	NA*	Lakes, creeks, and potential for fishing, hunting, hiking, and camping
674	P & SPNM	Cholmondeley Sound Area	NA	Three potential recreation sites (Nos. 51155, 51156, 51157) and one existing (No. 51158) located in this Recreation Place. Activities are water oriented and include boating, fishing, hunting, and camping.

SOURCE: Forest Service, Ketchikan Area, database.

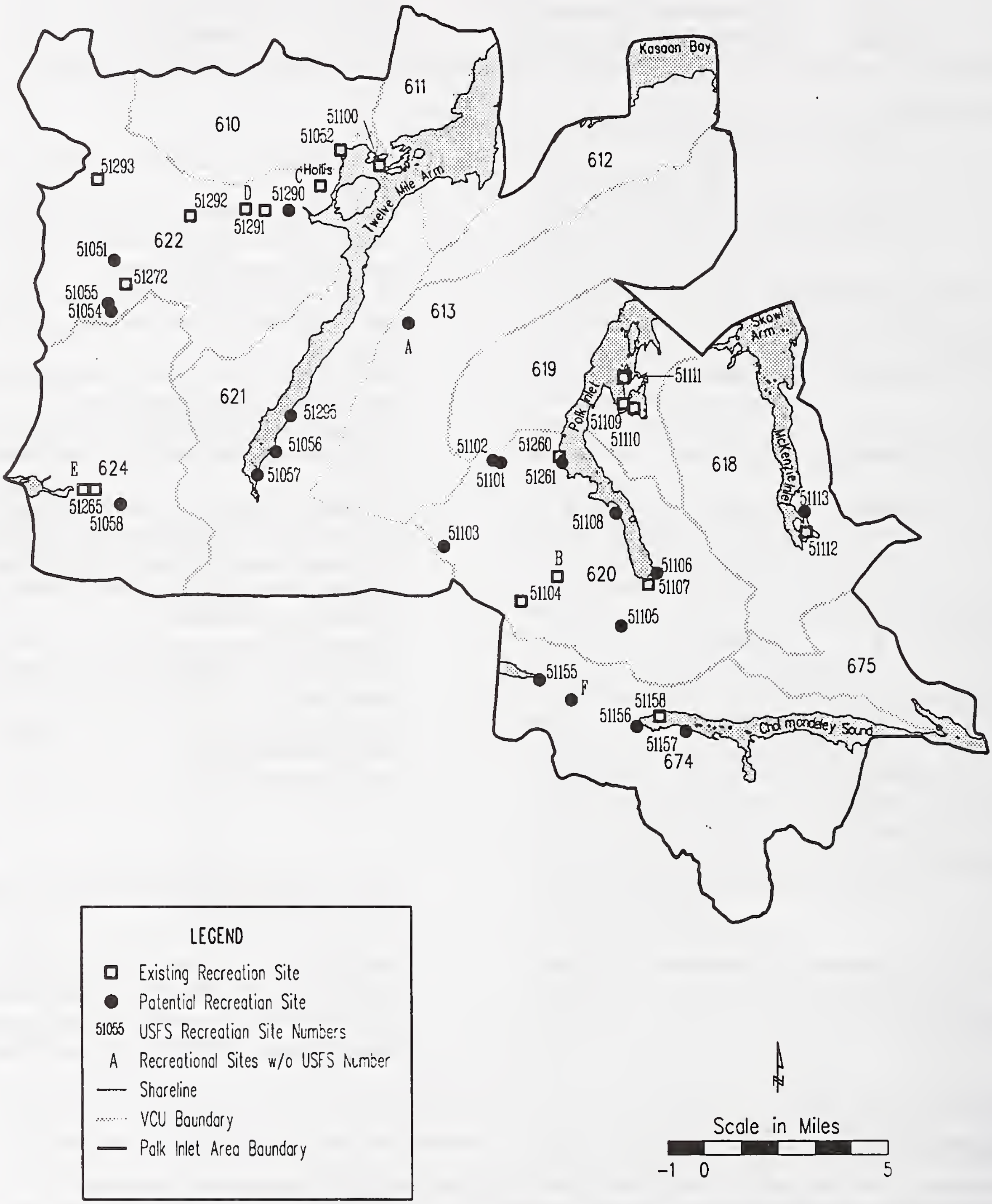
1/ High priority by Forest Service based on Forest Service Priority List of Recreation Development Projects for Prince of Wales and Associated Islands, 1992 to 1997.

2/ Identified as an existing opportunity for a recreation site, but not on an official Forest Service List of Potential Recreation Sites.

Note: Observation Site indicates the approximate location of a noteworthy scenic feature or a location from where an especially scenic view could be observed.

* NA = Not Applicable

Figure 3-32
Polk Inlet Project Area Recreation Site



SOURCE: Forest Service, Ketchikan Area, database.

Table 3-75
Popular Recreational Activities in the Craig Ranger District, 1991

Activity	Estimated Recreation Visitor Days 1/	Percent of Total Recreation Visitor Days
Viewing Scenery	50,000	35.0
Automobile Travel	20,000	14.0
Power Boating	20,000	14.0
Saltwater Fishing	15,000	11.0
Big Game Hunting	5,000	4.0
Tour Boat, Ship, Ferry	4,400	3.0
Motorized Aircraft	4,400	3.0
Freshwater Fishing	3,000	2.0
Picnicking	2,500	2.0
Trailer Camping	2,000	1.5
Hiking & Walking	2,000	1.5
Recreation Cabin Use	2,000	1.5
Other (Approximate RVD)	11,800	7.5
Total	142,100	100.0

SOURCE: Forest Service (no date).

1/ Recreation Visitor Day = use of a National Forest site or area of land and water by one person to participate in one or more recreation activities during a 12-hour period.

Viewing Scenery and Automobile Travel

As mentioned above, the Craig Ranger District ranked viewing scenery and automobile travel as the two most popular outdoor recreational activities in the district. Two main travel routes through the Project Area (the Hollis-Klawock Highway and Hydaburg Road) allow motorists to view corridors in the Project Area. An overlook located 2 miles west of the ferry terminal on the Hollis-Klawock Highway provides views of the Harris River estuary, the Indian Creek drainage, and mountains to the south and east. In addition to the two main roads, numerous logging roads throughout the Project Area allow vehicular access to Twelvemile Arm, Polk Inlet, the Harris River, and many streams.

Boating

The Craig Ranger District estimated that power boating was the third most popular outdoor recreational activity in the district, and that there were approximately 20,000 recreation visitor days spent on power boating in the district in 1991. Boats are commonly used to access the Project Area for recreational activities such as fishing, hunting, other gathering activities, and viewing scenery. Developed boat launching sites are limited. There is currently only one public concrete boat launching ramp in the Project Area, which is located at the State facility at Hollis. However, small boats can be trailered to and launched from the beach (at high tide) from several locations at both Twelvemile Arm and Polk Inlet. Five

existing anchorage sites have been identified by the Forest Service in the Project Area (Table 3-74) and receive an unknown amount of use. The anchorages were selected for factors such as scenery or excellent fishing opportunities, and may contain buoys or anchorages may simply be designated.

Fishing and Hunting

Fishing and hunting are popular with residents and visitors to Prince of Wales. The island's reputation as having excellent fishing is widespread and it has been mentioned as having possibly the best steelhead fishing in North America (Batin 1992). In addition to steelhead, the Project Area supports an impressive array of anadromous fish including pink, chum, coho, and sockeye salmon; cutthroat trout; and one species of char (Dolly Varden).

The distinction between subsistence and recreational fishing, hunting, and gathering is often not clear and is controversial. For this EIS, data that were not specifically categorized as subsistence are assumed to be recreational in nature. Because subsistence and recreational fishing and hunting often occur in the same locations, no distinctions were made in describing locations that supported both activities.

Youngsters enjoying sport fishing.

The Forest Service estimated that in 1991 there were 11,700 recreation visitor days associated with fishing activities (11,000 for saltwater) in the Craig Ranger District. Although the number of anglers is relatively low compared to other areas of Alaska, the number of resident anglers on Prince of Wales is increasing. Between 1984 and 1989 the estimated number of resident anglers increased 54 percent, from 5,750 to 8,873, which suggests that the number of resident anglers using the Project Area will continue to increase (Mills 1990).

There are a wide variety of saltwater fishing opportunities for marine and anadromous fish in the Project Area. Popular marine fishing areas near the Project Area include Thorne Bay,

Grindall Island off of the Kasaan Peninsula, and Twenty Fathom Bank (ADF&G 1991). Although King (chinook) salmon don't use streams in the Project Area for spawning, they do pass through marine areas near the Project Area and are very popular with anglers. Project field crews reported that most fishing activity in the Project Area was observed near or outside of the mouths of inlets rather than in the inlets themselves. They did, however, observe people setting and collecting crab pots in Twelvemile Arm. Curtis Anderson of Anderson Charters in Ketchikan, reported taking guests on 4- or 5-day fishing trips near the Project Area and that he uses all four project inlets (personal communication, C. Anderson, Anderson Charters, Ketchikan Alaska, September 14, 1992).

The ADNR reports that certain portions of the Project Area receive intense recreation use from local communities (ADNR 1988). Residents appear to use the Project Area much more than nonresidents. Because of the distances to the site and presence of better fishing in other areas, the Project Area does not appear to be visited by charter boats nearly as much as areas closer to Ketchikan. Charter boat operators from Ketchikan generally do not go to the Polk Inlet for short trips because of the distance. Some do go to the area for multiple day trips (personal communication, C. Anderson, Anderson Charters, Ketchikan Alaska, September 14, 1992).

There is a wide variety of fresh water fishing opportunities in the Polk Inlet region. Roads to many of the streams in the Project Area provide easy access to both resident and nonresident anglers. Prince of Wales Island is probably best known for steelhead fishing, although there are a number of other salmon and trout species available. Rainbow trout, cutthroat trout, and Dolly Varden are resident in the streams and are available year round. The Harris River is a very popular fresh water fishing location because of its runs of steelhead and salmon and its easy accessibility from the Hollis-Klawock Road and the Hollis ferry.

As with fishing, data concerning the types and numbers of hunters in the Project Area are limited. The Forest Service estimated that there were approximately 1,900 recreation visitor days devoted to hunting big game, small game, upland birds, and waterfowl in the Craig Ranger District in 1991 (Forest Service no date A).

The most popular big game species hunted in the Project Area for both subsistence and recreation purposes is the Sitka black-tailed deer (see *Subsistence* section, Table 3-59). As reported by Poremba (1993), some deer hunters come from Ketchikan to the Project Area specifically to hunt Sitka black-tailed deer. In addition to deer, big-game species hunted in the Project Area include black bear and wolf. DellaSala and Volsen (1993) and Poremba (1993) further discuss the distribution of Sitka black-tailed deer and other game species, and provide information concerning the harvest of big-game and other species in and near the Project Area for subsistence purposes. Popular locations in the Project Area for deer hunting by local residents are found primarily along road corridors (particularly along Hydaburg Road and Forest Road 21—the Polk Inlet arterial) and along the beach fringes of inlets, particularly Twelvemile Arm.

Picnicking/Day-Use

Picnicking and day-use activities are estimated to be the ninth most popular recreational activity in the Craig Ranger District. There are several picnic and day-use areas in the Project Area that help meet the demand. The most popular picnic/day-use area is One Duck Lake, which is located next to Hydaburg Road approximately 3 miles south of the intersection of Hydaburg Road and the Hollis-Klawock Highway. Although there are no developed facilities at the lake, it receives locally heavy use, particularly from children fishing. The

lake is stocked with rainbow trout once each summer, primarily for National Fishing Day. Up to 300 people attend the National Fishing Day festivities, the purpose of which is to teach children about fishing. During the rest of the summer, the lake continues to be a popular local recreational resource and receives enough use that the Forest Service is investigating ways to reduce overuse impacts to the lake and surrounding area.

There are two other existing, presumably day-use-oriented, recreation sites in the Project Area. Both are located along the Harris River and are accessible by vehicle from the Hollis-Klawock Highway. The more developed, and apparently used, of the two is the Harris Footbridge facility. A picnic table was recently installed at the site by the Forest Service. Although there is evidence of camping at both sites, the lack of developed facilities would not seem to support regular overnight use. As a result, most use appears to be day-use oriented, and includes activities such as fishing and picnicking.

In addition to developed and undeveloped picnicking and day-use areas, there are two interpretive facilities in the Project Area that can be used by picnickers and other day-use recreationists. As part of the development of fish passes at Cable and Trocadero creeks, the Forest Service, in conjunction with other agencies, built interpretive facilities that offer amenities for picnickers and other day-use recreationists. The facilities include signage describing the life cycle of salmon and steelhead, boardwalks, decks, benches, and parking areas. The extent of the use of the interpretive facilities is not documented.

Camping

Trailer camping along with hiking and recreation cabin use was estimated to be the tenth most popular recreational activity in the Craig Ranger District. However, there are currently no developed campgrounds in the Project Area. The closest developed campground is the Eagle's Nest Campground, located approximately 18 miles northeast of Klawock. With 11 sites, Eagle's Nest is the largest and most developed campground on Prince of Wales Island.

Four potential campgrounds have been identified by the Forest Service within the Project Area. One would be located somewhere near the Harris River, most likely in VCU 622. The campground would consist of approximately 10 camping units, picnic tables, fire rings, parking spurs, toilets, and signage. It would be convenient for travelers arriving by ferry late in the day, or for those waiting for a morning ferry.

The second proposed campground would be located in VCU 621 on the east shore of Twelvemile Arm near the head of the inlet. The campground would be a destination type of campground accessible by road. It would be similar in size and level of development to the Eagle's Nest Campground in the Thorne Bay Ranger District.

The third proposed campground would be located in VCU 620 near the head of Polk Inlet. It would be a family campground, but would be less developed than the Maybeso or Twelvemile Arm campgrounds. Like the other two, it would be accessible by road.

Dispersed camping also occurs to varying degrees throughout the Project Area. Camping along logging roads, and in quarries located alongside roads, does occur based upon field observation. Hunters sometimes drive to the ends of logging roads to gain backcountry access and camp near the ends of the roads. Field crews identified campsites at remote and difficult-to-access lakes such as Rock Lake and Upper Old Franks Lake. Access to the remote lakes is by floatplane or cross-country travel.


Visitors enjoying Trocadero Trail

Hiking

There are four existing developed trails and two potential Forest Service trail routes located entirely or partially within the Project Area. In addition to the maintained Forest Service trails, there are an undetermined number of dispersed trails not built or maintained by the Forest Service. Both maintained and unmaintained trails are used by hunters and anglers, as well as hikers, to access back-country areas. The existing developed trails vary in length from approximately 1.25 miles to over 4 miles, and provide access to a variety of landscape types. The four developed trails include the One Duck Trail (Forest Service Trail #736), the Harris River Trail (Forest Service Trail #775), the Twentymile Spur Trail (Forest Service Trail #734) (all located in VCU 622), and the Trocadero Trail (Forest Service Trail #737) in VCU 624. The One Duck and Trocadero trails have been identified for potential extension. A fifth developed trail, the Soda Bay Trail (Forest Service Trail # 741), is located just outside of the Project Area between the Hydaburg Road and the Soda Bay area. Two potential new trails in the Project Area would be the 4-mile-long Sulzer Portage Trail in VCU 674 and the 2-mile-long Old Franks Trail in VCU 618.

Recreation Cabin and Shelter Use

The use of Forest Service cabins and shelters in the Craig Ranger District is a popular recreational activity. Forest Service recreation cabins and shelters are available to the public for a fee of $20 per night and are generally located near remote lakes, rivers, streams, or saltwater beaches (Forest Service 1992b). They are usually accessible only by floatplane, boat, or trail. There is one existing recreation cabin and one existing recreation shelter in or near the Project Area. The Josephine Lake Recreation Cabin is located in an alpine area in VCU 673, just outside the extreme southern edge of the Project Area at an elevation of 1,800 feet. A three-sided Adirondack Shelter is located in the Project Area near the terminus of the 1.5-mile-long One Duck Trail.

There are three sites in or near the Project Area that have been identified by the Forest Service as potential sites for recreation cabins or shelters. Two of the potential sites are at either end of the Sulzer Portage on land selected by the Haida Corporation. A recreation cabin would be located at the extreme west end of Cholmondeley Sound and a recreation shelter would be located at the other end of the portage at the extreme east end of Hetta Inlet. Both would be located in VCU 674 and, if built, would be linked by the potential Sulzer Portage Trail.

The third potential recreation cabin and shelter site would be located at the end of Twelvemile Arm in VCU 621 and would feature barrier-free access (Forest Service no date B). The potential Twelvemile Cabin has been identified as a priority project by the Forest Service.

Local Residents Activities and Use Patterns

In an effort to obtain information on local recreational activities and use patterns, Polk Inlet Project Subsistence interviewers asked residents of several communities in the general vicinity of the Project Area several recreation-oriented questions. The interviews determined that three activities were clearly the most popular among the local residents contacted: picnicking, hiking, and sightseeing/wildlife viewing. The interviews disclosed that half of the subsistence respondents reported that their subsistence activities and recreational activities occurred in the same areas. Approximately half the residents also reported that they have viewed outfitters using the same areas they use for recreation. Of those residents who had viewed outfitters, 57 percent said the outfitters had not interfered with their recreational

experience or caused them to alter their recreational activities. Thirty-two percent reported that they were negatively affected by outfitters, and 4 percent did not know.

Although the presence of outfitters did not bother most recreationists, the presence of nonlocal people recreating did bother many. Approximately 85 percent of those questioned who had viewed nonlocal people recreating believed nonlocal people interfered with their recreational experience or caused them to modify their recreational activities.

The following sections discuss the more popular recreational activities that occur within the Project Area.

Commercial

Information concerning the intensity of commercial outfitter and guide use of saltwater areas in the Project Area is unavailable. It would be reasonable to assume that saltwater areas popular with recreational anglers are also used by commercial outfitters and guides.

Outfitters and Recreational Special use Permits

Information is available concerning the locations of freshwater rivers and creeks popular with commercial outfitters and guides. In 1992, the Ketchikan Area Office of the Tongass National Forest completed a Draft Environmental Analysis (EA) of outfitter and guide use of freshwater systems on Prince of Wales. The EA compiled a list of river and creek systems on Prince of Wales for which permits had been requested by outfitters and guides. As shown in Table 3-76, of the freshwater systems within the Project Area for which permits were requested , the Harris River received the greatest number of requests by outfitters and guides.

Table 3-76
Project Area Streams and Rivers for which Outfitter/Guide Permits were Requested

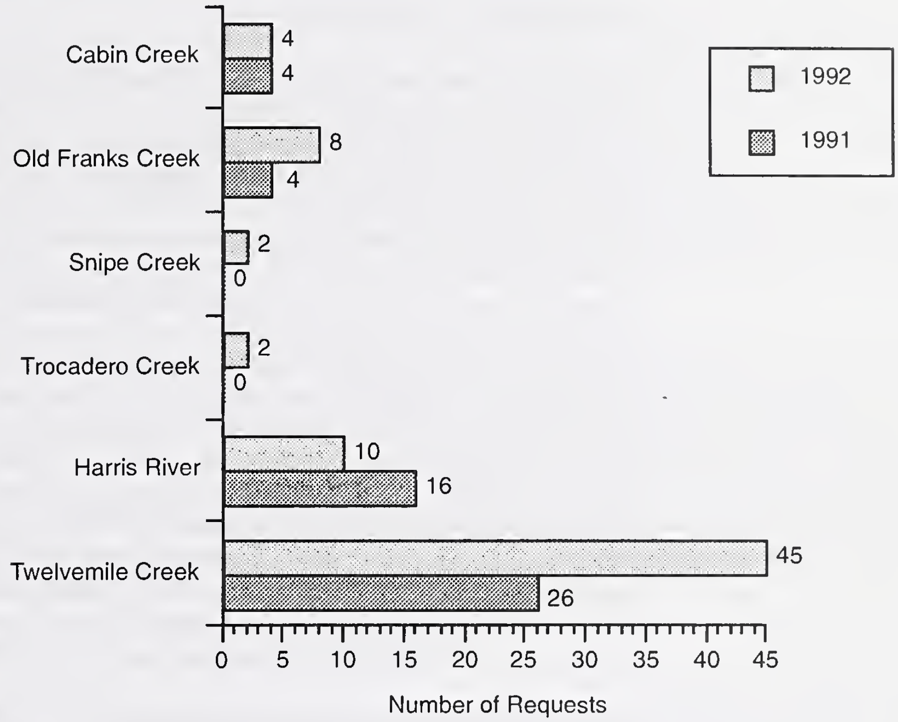
Stream	Number of Requests
Twelvemile Creek	5
Harris River	9
Big Creek	3
Polk Inlet Creeks	3
Trocadero Creek	4

SOURCE: Forest Service 1992b.

The EA also asked outfitters and guides to report the location of areas where they had taken customers in 1991 and 1992, and to report the number of service days (clients) at each location. As Figure 3-33 illustrates, Twelvemile Creek was by far the most popular location in the Project Area for commercial outfitters and guides. Figure 3-33 also indicates that the number of customers being taken to fish in the Project Area has increased between 1991 and 1992 for most creeks and the Harris River.

Figure 3-33

Number of Service Days (Clients) at Project Area Locations Used by Outfitters and Guides in 1991 and 1992



SOURCE: Forest Service 1992b.

Recreational Resources by VCU

This section discusses existing and potential recreation resources found in each VCU in the Project Area. The primary focus of the section is on recreation sites, but existing and potential activities are also discussed.

VCU 610 (Maybeso Experimental Forest)

This VCU contains the 11,000-acre Maybeso Experimental Forest. There are no developed or potential recreation sites identified by the Forest Service or other agencies in this VCU. Maybeso Creek is a particularly productive stream for pink salmon and contains chum and coho salmon, steelhead, cutthroat, and probably Dolly Varden char.

VCU 611 (Outer Point)

This VCU contains land on both sides of upper Twelvemile Arm. There is currently one informational sign near the ferry terminal and no potential recreational facilities identified by the Forest Service. Pellet Creek (and possibly Wolf Lake) may contain salmon species and cutthroat trout.

VCU 612 (Kina Cove Uplands)

There are currently no existing or potential recreational facilities identified by the Forest Service or any other agency in this VCU. There are several streams and lakes that contain salmon and trout species.

VCU 613 (Old Franks Creek)

Old Franks Creek flows through this VCU and connects several lakes southwest of Old Franks Lake (which is located in Sealaska property). Currently, no existing or potential recreational sites have been identified in the VCU by the Forest Service or any other agency; however, there is a small dispersed campsite on the southern shore of Upper Franks Lake. The Old Franks Creek recreation place, depicted in Figure 3-32, is within VCU 613. The recreation place is composed of areas with ROS settings of RM and SPNM. The Old Franks recreation place is not heavily used at the present time, but has a number of recreational resources that would likely be of interest to recreationists if it were more accessible. The Forest Service has discussed a potential trail in the Old Franks area that would make access within the area easier. There are several lakes in VCU 613 (including Lake Mary, Old Franks Lake, and Upper Old Franks Lake) that contain native cutthroat trout, rainbow trout, Dolly Varden, and kokanee. They offer excellent fishing opportunities but are difficult to access. Most access is by floatplane. However, a recently constructed logging road in the upper drainage provides roaded access to a 3/4-mile section of stream above the lakes. The Forest Service, with cooperation from the ADF&G, recently installed two fish passes that have opened up the entire Old Franks Creek and Lake system to anadromous fish. The ADF&G is also in the process of introducing sockeye and coho salmon to the Old Franks Creek and Lake system, which will dramatically improve the area's fishing potential and should increase the number of recreational anglers that fish in the system.

VCU 618 (Skowl Arm and McKenzie Inlet)

VCU 618 contains McKenzie Inlet and the Old Tom Creek Research Natural Area. There is an existing designated Forest Service anchorage site south of Peacock Island near the head of McKenzie Inlet. The Forest Service has also identified a site along the inlet northeast of Peacock Island as a potential dispersed camping site. The steep coastline and cliffs north of Thumb Point on the east side near the entrance of McKenzie Inlet has been identified by the ADNR as an area having attractive features. A potential campsite there was also identified (ADNR 1988). Many of the bights and coves near Skowl Cove and McKenzie Inlet are used as anchorages (ADNR 1988). McKenzie Inlet contains seven streams that support, to varying degrees, runs of pink, chum, coho, and sockeye salmon and steelhead. Residents and guests of the lodge at Saltery Cove use Skowl Arm for shrimping and crabbing and fish throughout McKenzie Inlet and, in particular, Old Tom Creek.

VCU 619 (Upper Polk Inlet)

This VCU encompasses the northern half of Polk Inlet and includes Goose Bay, Little Goose Bay, and the Cabin Creek watershed. Goose Bay and the section of coastline between it and Little Goose Bay is very scenic. The Forest Service has identified two observation sites and one anchorage site in VCU 619 near Goose Bay. The numerous islands and small inlets of Goose Bay and Little Goose Bay have been identified by the State of Alaska as having "especially important wildlife habitat, harvest, and recreation values." There are several anadromous fish streams in VCU 619 such as Cabin Creek and other smaller unnamed streams.

VCU 620 (Lower Polk Inlet)

VCU 620 includes the southern half of Polk Inlet and the Dog Salmon, Rock and Polk Creek drainages. There are four existing and seven potential recreation sites in VCU 620. An existing observation site and a potential family campground would be located near the head of Polk Inlet. There are two potential boating sites and one existing observation site on the west side of the inlet. An additional five existing or potential recreation sites are located adjacent to four lakes (Rock, Dog Salmon, and two unnamed) located in the hills above Polk Inlet. Dog Salmon Lake is located near a logging road and is easily accessible. Anglers were observed by field crews fishing at Dog Salmon Lake. Field observation also disclosed a dispersed campsite on the shore of Rock Lake. There is no established trail to Rock Lake, so access is by floatplane or by cross-country hiking. Access is also difficult to the two unnamed lakes, one of which has been identified as the site of a potential recreation shelter. Below Dog Salmon Lake, alongside Dog Salmon Creek, is the Dog Salmon Creek fish pass. The fish pass has interpretive displays, a small parking area, walkways and trails, and can be used by day-use recreationists.

The head of Polk Inlet is accessible by motor vehicle, and small boats can be launched from the beach near the head at high tide. Waterfowl, black bear, and clams are harvested at the head of Polk Inlet, which receives intensive community use by residents of Hydaburg and Saltery Cove (ADNR 1988). In 1989, the Forest Service, in conjunction with the ADF&G and with local private sector help, completed the Dog Salmon Fish Pass and Interpretive Facility on Dog Salmon Creek near Forest Road 21. The creek contains pink, chum, coho, and sockeye salmon. Other anadromous streams in VCU 620 popular for fishing include Goose Bay, and Rock and Cabin creeks (ADNR 1988).

VCU 621 (Twelvemile Arm)

VCU 621 encompasses virtually all of Twelvemile Arm, most of which is accessible only by boat or floatplane. However, Forest Road 21 provides roaded access near the head of the arm. Forest Road 2120 branches off Forest Road 21 and continues approximately 2 miles up the east side of the inlet past a potential family camping site and a potential site for a recreation cabin. Access on Forest Roads 21 and 2120 can be hazardous for recreationists due to heavy logging truck traffic and areas where vegetation obscures sightlines.

Although all of Twelvemile Arm is used by Hollis residents for recreation, the head of the arm and nearby Cave Creek are used most extensively (ADNR 1988). The head is used as an anchorage and for crabbing, and the adjacent land is used for hunting black bear. Small boats can be trailered to and launched from beaches near the head of the inlet at high tide. A potential launch site has been identified near the end of Forest Road 2120. Salmon fishing occurs at Cave Creek, Twelvemile Creek, and several smaller, unnamed creeks. Several fishing outfitters and guides have shown an interest in obtaining outfitting and guiding permits for Twelvemile Arm Creek.

VCU 622 (Hollis and Harris River Area)

VCU 622 contains much of Hollis, the Harris River, Indian Creek, the One Duck Lake area, the Hollis-Klawock Highway, and the Hydaburg Road. There are eight existing Forest Service recreation sites and four potential sites in the VCU. Existing and potential recreational facilities are concentrated in two main areas, near One Duck Lake and along the Harris River. Three existing and maintained Forest Service trails (the Harris River, One

Duck, and Twentymile Spur trails) are also located in the VCU. Although there are no immediate plans to do so, the One Duck Trail may be extended east of One Duck Shelter approximately 6 miles to the Harris River.

One Duck Lake is popular with locals as a picnic area and for fishing (particularly with children). The lake is stocked once each summer and is used for a popular children's fishing event. Nearby and across the Hydaburg Road from One Duck Lake is the trailhead to the One Duck Trail, which leads to the top of a nearby mountain and the One Duck Shelter. A family picnic area has been identified as a potential amenity to One Duck Lake.

Existing recreation facilities along the Harris River corridor include the public float and boat ramp at Hollis, the Hollis-Klawock Highway overlook, the Harris River Trail, the Harris footbridge facility, and a dispersed site on the Harris River accessible via road from the Hollis-Klawock Highway. A Forest Service family campground is planned in the vicinity of Maybeso Creek or the Harris River. Recreation along the Harris River and estuary is oriented toward fishing, hunting, and picnicking. The Harris River is a very popular location for fishing because of its proximity to the Hollis Ferry and Hollis-Klawock Road and also because of its excellent fishing. The river is considered a major salmon producing system, and nine commercial outfitter/guides have indicated interest in obtaining outfitting/guiding permits from the Forest Service. In addition to fishing, both the river and estuary receive intense sport harvesting of waterfowl, black bear, and deer, primarily by Hollis residents (ADNR 1988). Besides the Harris River, the Twentymile and Indian creeks are also popular with anglers. Both support or receive various species of salmon and trout.

VCU 624 (Hydaburg Road Corridor and Cable Creek)

Existing and proposed recreational and educational facilities are concentrated near Cable Creek and the head of Trocadero Bay. The facilities near Cable Creek are accessible via Forest Road 21 and include the Cable Creek Fish Pass, the Cable Creek viewing platform, and a proposed family picnic area. The Trocadero Trail begins adjacent to Hydaburg Road and continues approximately 2 miles to Snipe Creek. There are plans by the Forest Service to extend the trail to the estuary near Trocadero Bay. Snipe and Beaver creeks are major tributaries of Cable Creek, and along with Cable Creek, support anadromous fish and recreational fishing. The lower section of Trocadero Creek and the Trocadero estuary also support recreational fishing (ADNR 1988).

VCU 674 (West Arm Cholmondeley Sound and Big Creek)

The West Arm of Cholmondeley Sound is a pristine and scenic area that receives dispersed recreational use. The head of the inlet is a particularly rich area for wildlife and supports fishing, shrimping, and waterfowl hunting (ADNR 1988). The entire area is included in the west arm of Cholmondeley Sound recreation place. Within the recreation place, the Forest Service has identified one existing recreation site (an anchorage) in VCU 674 and has identified 3 potential recreation sites: a cabin, a shelter, and a trail. The existing anchorage and the potential cabin site is located near the head of the inlet. Approximately 2.5 miles to the west of the head of West Arm, at the head of Portage Bay, is the potential shelter site. The Portage Bay and West Arm cabins would be linked by a trail through the Sulzer Portage. All three sites, however, are on Haida Corporation select land, so the development of these potential recreation sites by the Forest Service is in doubt.

The entire West Cholmondeley Sound recreation place, particularly the inlet to Big Creek and the Big Creek area, have high scenic and dispersed recreation value. The Big Creek area is a popular recreation area for fishing, hunting (deer, black bear, and waterfowl), and other

dispersed activities. The area receives intensive community use from Hydaburg and Sunny Cove (ADNR 1988). Big Creek was determined to be eligible for inclusion into the Federal Wild and Scenic River program as a Wild River because it is "outstandingly remarkable and is regionally significant for its fisheries, wildlife, recreation and scenic values" (ADNR 1988). It was not recommended for designation by the Forest Service, however, but is currently one of the most pristine salmon streams in the study area. Big Creek contains pink, chum, coho, and sockeye salmon in addition to Dolly Varden and cutthroat trout. Three commercial outfitter/guides have expressed interest in obtaining outfitter and guide permits for Big Creek from the Forest Service. Other streams in VCU 674 contain various salmon and trout species and potentially support recreational angling. Two high altitude lakes (Gertrude and Josephine) likely contain cutthroat trout. There is a Forest Service recreation cabin at Lake Josephine, although most of the lake is out of the Project Area.

VCU 675 (Sunny Cove)

Sunny Cove is used as an anchorage and receives intensive community use from Sunny Cove and Hydaburg (ADNR 1988). Community use includes black bear, waterfowl, and deer hunting; wildlife viewing; and fishing. Sunny Creek supports pink, chum, coho, and sockeye salmon; Dolly Varden; and steelhead. A fish pass completed in 1986 has increased potential spawning and rearing habitat.

Future Recreational Resources Near the Project Area

The Southeast Alaska Visitors Information Center (SEAVIC) is currently being constructed in Ketchikan under contract by the Forest Service. SEAVIC will serve as a one-stop information center for visitors to Southeast Alaska. Congress authorized a study which is underway to examine an annex SEAVIC facility in Hydaburg. If the annex is built, visitation to Hydaburg would undoubtedly increase, and the number of people driving through the Project Area to Hydaburg would likewise increase.

Roadless Areas

Part of the Polk Roadless Area (Roadless Area 519) is located within the Project Area and is the only part in the Project Area that meets the minimum criteria for potential inclusion in the National Wilderness System (Forest Service 1991a). Roadless areas identified in the inventory presented in the TLMP Draft Revision may again be considered for wilderness recommendation or may be managed for a wide range of other resource management activities. Once an area is roaded, it is generally no longer available for wilderness consideration. Depending on when and how the activity was conducted, evidence of previous timber harvest, abandoned habitations, and historical mining may not necessarily result in an irreversible removal of land from future wilderness consideration.

To qualify as roadless, an area must contain at least 5,000 acres of undeveloped land that does not contain improved roads maintained for travel by passenger-type vehicles. However, areas less than 5,000 acres may qualify if they constitute a self-contained ecosystem such as an island, are contiguous to existing wilderness, or are ecologically isolated by topography and manageable in a natural condition. Roadless areas may retain their roadless character by being managed for emphases that require relatively large, undeveloped or natural areas such as are usually required for old-growth habitat, scenic backdrops, or primitive recreation. Roadless areas are generally composed of the three "roadless" ROS settings. They are Primitive, and Semi-Primitive Non-motorized, and Semi-Primitive Motorized.

The Polk Roadless Area is accessible via an extensive road system, by boat through Kassan Bay and Skowl Inlet (which are located outside of the Project Area), and by floatplane.

Because the area is accessible, and relatively close to Ketchikan, it receives more use than most places on Prince of Wales (TLMP Draft Revision 1991a). Within the roadless area is the Old Tom Creek Research Natural Area. Just outside of the roadless area (and Project Area) is a fishing lodge in Clover Bay and a recreation cabin at Trollers Cove. Local residents use the roadless area extensively for recreation and subsistence.

The Polk Roadless Area is in the primary sale area of the KPC Long-term Sale Contract. Timber harvest has occurred around the perimeter for many years and will continue in the future. The 1989-94 EIS for the KPC Long-term Sale approved 2,187 acres of harvest near Polk Inlet and Old Franks Creek drainage. Because of past and present logging and Native and State selections, the natural integrity of the Polk Roadless Area is not ideal, particularly in the western half of the area. In the eastern half of the area, however, opportunities for solitude are great as are opportunities for saltwater, upland, and primitive recreation.

Eligible Wild, Scenic, and Recreational Rivers

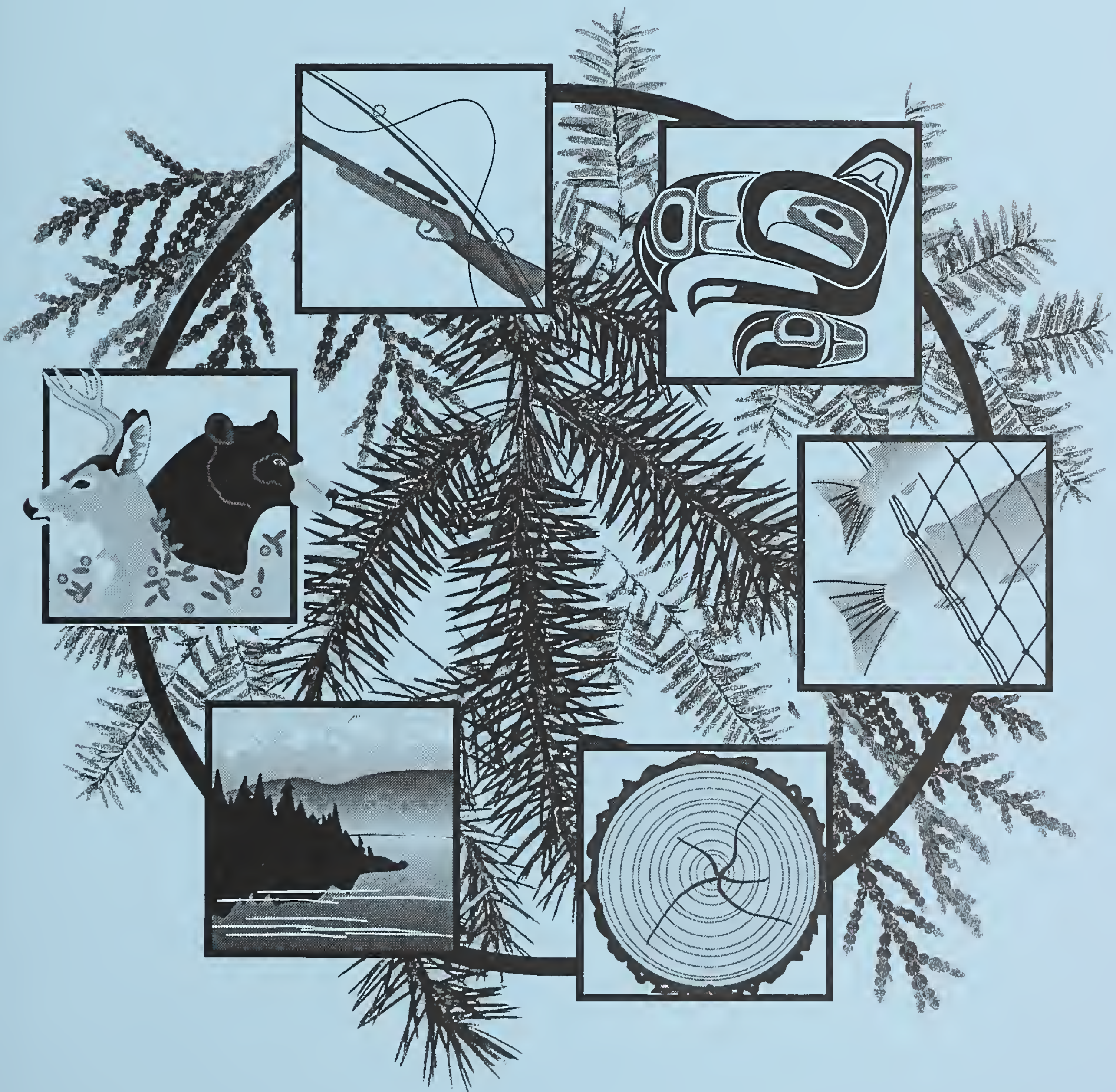
The Wild and Scenic Rivers Act of 1968 recognizes and protects the free-flowing character and the outstandingly remarkable scenic, recreation, geological, fish and wildlife, historic, cultural, ecological, and other values of selected rivers. Both Big Creek and the Harris River were considered for inclusion in the National Wild and Scenic River System by the Forest Service (TLMP Draft Revision 1991a). All 5 miles of Big Creek (in VCU 674) were determined by the Forest Service to meet the criteria used for classification as a Wild River. Seven miles of the Harris River (from where it enters Harris River Bay to near the Twentymile Spur trail) were determined by the Forest Service to meet the criteria used for classification as a Recreation River. Both rivers are recommended for inclusion into the National Wild and Scenic Rivers System in Alternatives A and B of the TLMP Draft Revision. Neither river is recommended for inclusion in Alternatives C, D, and P.

Wilderness Areas

The 38,046-acre Karta Wilderness was established in 1990 as part of the TTRA. The wilderness encompasses the drainage of the Karta River system at the head of Kassan Bay and is adjacent to the Project Area along the boundary of the Maybeso Experimental Forest. The wilderness is popular among recreationists in part because of its easy access from Hollis and Ketchikan (three hours away by ferry). The four Forest Service recreation cabins within the wilderness are in such high demand that reservations are managed using a lottery system. The Karta River is popular with recreational anglers and subsistence users.

Chapter 4

Environmental Consequences



Chapter 4

Environmental Consequences

Introduction

This chapter provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. It presents the expected effects on the physical, biological, social, and economic environments associated with implementation of the alternatives. All significant or potentially significant environmental consequences to each resource area are disclosed, including the direct, indirect, and cumulative effects. These effects may have consequences that are both beneficial and detrimental. The means by which potential adverse effects might be reduced or mitigated also are described for each alternative. Effects are quantified where possible, although qualitative discussions are often necessary. Finally, each section discusses monitoring recommendations for each resource area.

Analyzing Effects

Chapter 4 begins by detailing the environmental consequences of the alternatives by the same categories used in the description of the affected environment in Chapter 3 (i.e., timber, wildlife, economic, and social, etc.). Within each category, the direct, indirect, and cumulative effects are disclosed. *Direct environmental effects* are defined as those occurring at the same time and place as the initial cause or action. *Indirect effects* are those that occur later in time or are spatially removed from the activity but would be considered significant in the foreseeable future. *Cumulative effects* result from the incremental effects of actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. The reasonably foreseeable time frame over which both direct and indirect effects are estimated is here interpreted to mean until the end of the KPC Long-term Contract (i.e., the year 2004). Cumulative effects are also projected for various resources up to the year 2054 and 2140. The year 2054 is the year by which most areas within LUD's permitting timber harvest will be converted from old-growth to second-growth timber management. The year 2140 is when the TLMP estimates the management emphasis or desired future condition will be reached.

The cumulative effects analysis in this document tiers to the current Tongass Land Management Plan (TLMP) (1979a, as amended). It also considers the 10-year timber sale action plan referenced in Appendix A which is used to project the volume range to be harvested in each operating period through the end of the Ketchikan Pulp Company (KPC) contract. As a result, the cumulative effects do not depend entirely on the alternatives presented in this EIS. Rather, they include what may be expected under the direction detailed in TLMP. The decisions made in TLMP provide long-range direction for management of the Tongass National Forest for the duration of the Forest Plan. Cumulative effects analyzed in this EIS include both the effects of this project and those projected by the TLMP Draft Revision, Alternative P, which is hereby incorporated by reference.

4 Environmental Consequences

The following assumptions were made to assess the reasonably foreseeable effects to the year 2004. These assumptions reflect current management and technology of National Forests and provide a uniform approach to estimating effects of timber harvest and road construction.

- Laws, guidelines, and Best Management Practices (BMP's) for resource protection would be followed. These requirements are expected to be at least as stringent in the future as they are today.

- Timber sale planning would occur in an interdisciplinary fashion.

- All acres of suitable commercial forest land are equally subject to impacts.

- The no-action alternatives would represent only a delay in implementing the TLMP and, based on volume projections, foreseeable cumulative effects would begin to occur before 2004.

- Future effects on resources from ongoing timber harvest and road construction will be similar to impacts projected for current alternatives.

Chapter 4 concludes with other environmental considerations that must be addressed under the National Environmental Policy Act (NEPA) but do not fall under the categories discussed in Chapter 3. These topics include unavoidable adverse environmental effects, the relationship between short-term uses and the maintenance and enhancement of long-term productivity, the irreversible and irretrievable commitments of resources, possible conflicts between the proposed action and the plans of other jurisdictions, and other environmental considerations.

- *Short-term effects* are those that occur annually or within the first 10 years of project implementation.

- *Long-term productivity* refers to the capability of the land and resources to continue producing goods and services for 50 years and beyond.

- *Irreversible commitments* are decisions affecting nonrenewable resources such as soils, minerals, plant and animal species, and cultural resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed. The gradual decline in old-growth habitat or significant loss of soil productivity would be considered irreversible commitments. Land-use designations (LUD's) allowing land-altering activities were established by the Forest Plan, but the actual commitment to develop, use, or affect nonrenewable resources in the Polk Inlet Project Area was made in the development of this project.

- *Irretrievable commitments* represent opportunities foregone for the period during which resource use or production cannot be realized. These decisions are reversible, but the production opportunities foregone are irretrievable. An example of such commitments is the allocation of LUD's that do not allow timber harvest in areas containing suitable and accessible timber lands, a decision that is made at the Forest Plan level. For the time over which such allocations are made, the opportunity to produce timber from those areas is foregone, thus irretrievable.

Air Quality

Key Terms

Ambient air—that air, external to building, encompassing or surrounding a specific region.

All of the management alternatives are expected to have limited, short-term impact on the ambient air quality. Alternatives 1 and 1a, the No-Action Alternatives, would result in the least emission of particulate and gaseous air pollutants in the near term. The potential for uncontrolled forest fires eventually might be increased under these alternatives, and the levels of air pollution that would result are likely to be comparable to those associated with other alternatives.

Local sources of airborne particulates produced or increased by the action alternatives include motor vehicle emissions, dust from road construction and motor vehicle traffic, residential and commercial heating sources, marine traffic, and the Ketchikan Pulp Company mill at Ward Cove. No prescribed burning is proposed in any alternative so there will be no effect on air quality from this source. Fugitive dust generated from road construction and increased vehicular traffic may temporarily affect air quality.

The action alternatives would result in a continued supply of raw wood products to the Ketchikan Pulp Company (KPC) mill at Ketchikan. This would indirectly affect air quality in the vicinity of Ketchikan. It is KPC's responsibility to ensure that emission from the mill are within legal limits.

The direct and cumulative effects of the proposed action alternatives upon air quality will be a continuation of the existing local ambient air quality.

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Geology, Minerals, and Caves

Key Terms

Carbonate rocks—rocks such as limestone and dolomite which contain a high content of calcium carbonate, $CaCO_3$.
Cave resources—any material or substance occurring in caves on Federal lands, such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens, and speleothems.
Cave—any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.
Karst—a type of topography that develops in areas underlain by soluble rocks, primarily limestones.
Sinkhole—relatively shallow, bowl- or funnel-shaped depressions ranging in diameter from a few to more than 3,000 feet.

Direct, Indirect, and Cumulative Effects on Minerals

The timber sale would have no direct impact on actual mineral sources. In general, the project would affect mining activities by providing easier access for mapping and surveying because of road construction and access to less developed or undeveloped areas. Geologic mapping would also be enhanced by increased exposure due to timber harvest. Recent undisclosed discoveries south of the Harris River near Indian Creek might benefit from increased road access (ADNR 1988) under Alternatives 3 and 4. Seven prospects and claims are near potential harvest units (Table 4-1).

Table 4-1
Mining Claim, Commodity, and Closest Unit

Claim[1/]	Commodity	Closest Unit	Alternatives
Dolly Varden	copper, gold, silver	621-207	F2, 3, 4, F5
Marble Heart	lead	621-237	F2, 3, 4, F5
Shelton	copper, gold, silver	621-310	3
Clark 49	copper	624-203	F2, 3
Cable Creek[2/]	unknown	624-201, 222	3, 4
Unknown[2/]	unknown	674-253	4
Joy	gold	620-316	F2, F5

SOURCE: Stewart and Jackson 1993.

1/ Claimant names and addresses are contained in Stewart and Jackson (1993).

2/ Not listed in Forest Service, Bureau of Mines, or Bureau of Land Management records; discovered in field.

Two claims are in the vicinity of proposed roads though no claim markers were found during field investigation. These are the Shelton claim (Unit 621-310) and the Dolly Varden claim (Unit 621-237). Establishing an extensive roadbed in these areas could inhibit sample collection at those specific locations, but the overall impact of forming road cuts and increasing accessibility should facilitate sample collection. The Shelton claim would be affected under Alternative 3, while the Dolly Varden claim would be affected under all action alternatives. The Joy claim is located near a unit prescribed for helicopter logging, which would not affect the claim. Unit 621-310 is also a helicopter unit and will not affect access to the Shelton claim. Access to the Dolly Varden claim may be improved.

The Cable Creek claim group could be located only to the quarter section and is located in T75S, R86E. Claims located within the same quarter section as a unit were judged to be potentially affected. These potentially affected units are 624-201 and 624-222; evidence of mining claims was found throughout much of unit 624-222. Impacts to these claims, if any, would be similar to those described above and would occur in all action alternatives.

A claim marker was discovered in Unit 624-222 and 674-253 during field investigation (Table 4-1). These claims were not listed on Forest Service, Bureau of Mines, or Bureau of Land Management records. Access to Unit 624-222 would be slightly improved under all action alternatives. Unit 674-253 is a helicopter unit; however, road construction would occur to within approximately 1 mile of the unit. Therefore, access to the site would be improved under Alternative 4.

There are no known mining claims potentially affected by Alternative 1a. Under this alternative, however, increased road access into the Indian Creek Valley, McKenzie Inlet, and small areas west of the Hydaburg Road would not occur.

Long-term cumulative effects on mining claims would be increasing access and exposure for mineral exploration due to roads and improved access. If mining development occurs, the road connection to Hollis, Klawock, and Craig would facilitate market access.

Direct, Indirect, and Cumulative Effects on Caves

The purpose of the Federal Cave Resources Protection Act of 1988 is to secure, protect, and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people. Caves determined to be significant under the act are to be considered for listing on the National Significant Cave List. Specific locations of significant caves are not disclosed to the general public. Cave management guidelines are contained in the TLMP Draft Revision Standards and Guidelines (TLMP Draft Revision 1991a). Newly discovered caves are temporarily managed as Class 1 or sensitive caves until an analysis of resource values is completed. If an analysis indicates that a cave has no significant values and is documented as such, it would no longer be managed as a cave resource.

The complexity of the karst landscape was emphasized during a Forest Service-sponsored seminar in Ketchikan in February 1993. As one outgrowth of this seminar, the Forest Service appointed a Blue Ribbon Panel of karst specialists to provide a Ketchikan Area review of forest conditions, karst features, and management policies. The Panel's report (Aley et al. 1993) made recommendations regarding future studies and methods of analysis. The Panel's recommendations have been incorporated into Forest Service operations policy including a karst vulnerability assessment process. Vulnerability will be ranked as low, medium, or high relative to sensitivity to possible damage as a result of timber harvest activities. This karst vulnerability process will be implemented prior to timber harvest or road construction for the Polk Inlet Project Area. Any significant karst resources that are discovered through this process will be protected by application of appropriate standards and guidelines.

Alternatives F2, 3, 4, and F5 include three harvest units in VCU's 624, 674, and 675 that have karst or small cave features associated with them. Potential environmental effects from timber harvest and road activities adjacent to cave openings include: (1) blocking the cave entrance by vegetative debris or sediment related to road construction; (2) altering the cave's microclimate by removal of vegetation with related effects to delicate carbonate features; (3) eroding cave deposits or destroying delicate carbonate features by diversion of surface drainage into a cave; and (4) causing instability on steep, sinkhole sideslopes by removal of vegetation contributing to cave sedimentation or entrance blocking.

No known cave resources have been directly affected by past timber harvest and road building in the Project Area. Future activity would prevent effects to cave resources by avoiding caves or by prescribing site-specific mitigation measures. Consequently, long-term cumulative effects to cave resources are expected to be minimal.

Mitigation

Mining claimants who might be affected should be notified during final sale preparation. A list of all claims and claimants are contained in the Minerals and Geology Resource Report for the Polk Inlet Project Area (Stewart and Jackson 1993). Known mineral improvements, such as mine claim markers and test holes, will be protected by specifications in timber sale and road construction contracts (Mitigation Measure M1). The two claim markers found during field investigations are noted on the unit cards. U.S. mining laws confer a statutory right to enter the public lands to search for minerals. Therefore, access to mining claims would not be prevented by road access management prescriptions (see the *Transportation Facilities* section of this chapter). However, miners and prospectors would be required to obtain a permit to use restricted roads.

No-cut buffer zones around significant cave features and their localized surface water contributing area constitute site-specific protective measures. These measures would prevent alterations to the hydrologic, microclimatic, and sediment systems of the significant caves (Mitigation Measure M2). Additional site investigations would be required prior to final unit layout for the three harvest units with karst features to ensure that significant caves were identified. Detailed investigation of these caves, including subsurface exploration, could demonstrate that they do not contain significant resources or do not form part of a larger subsurface system. If such nonsignificance was determined, the mitigation measures would not be required. To maintain confidentiality, mitigation measures are not identified on the unit cards included with this EIS. The Ketchikan Area geologist and Craig Ranger District Resource Specialist would be responsible for notifying final layout crews about harvest units with significant caves. Unit cards provided to final layout crews would contain the site-specific mitigation measures and locations.

Monitoring

No project-specific monitoring is recommended. Routine implementation monitoring would document that units with cave resources have been examined and laid out as prescribed before release. Implementation of all prescribed mitigation measures for caves would be documented after timber harvest occurs.

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Soils

Key Terms

Glacial till—gravel, boulders, sand, and finer materials transported and deposited by a glacier.
Mass movement index (MMI)—rating used to group soil map units that have similar properties with respect to the stability of natural slopes.
Mass movement—general term for a variety of processes by which large masses of earth material are moved downslope by gravity either slowly or quickly.
McGilvery soil—shallow, forested, organic soil developed over bedrock.
Sediment—solid materials, in suspension or transported by water, gravity, ice, or air.
Soil productivity—capacity of a soil to produce plant growth, due to the soil's inherent chemical, physical, and biological properties.
V-notch—a shallow to deeply cut stream drainage, generally in steep, mountainous terrain; would look like a "V" from a frontal view.

Introduction

Soil disturbance is an unavoidable consequence of timber harvest and road construction. Even though mitigation steps are taken to reduce disturbance, it is not possible to eliminate it completely. The level of disturbance varies with management practices and site characteristics. Areas most susceptible to unacceptable disturbance from management activities were identified during both office preview and field verification of units and were eliminated from the harvest units. The areas that were eliminated included those of very high mass movement hazard and areas with greater than 41 percent very shallow organic soils (i.e., McGilvery series).

Soil impacts can be reduced below threshold levels by adhering to Soil Management Handbook Standards and Guidelines FSH 2509.18, Best Management Practices (BMP's) of the Soil and Water Conservation Handbook FSH 2509.22, and the application of erosion control provisions of the timber sale contract. The standards and guidelines, BMP's, and contractual provisions include specific logging requirements such as one-end or full-log suspension, split yarding, controlled felling.

Direct and Indirect Effects

The following discusses the effects of timber harvest on soil productivity and soil erosion. Soil productivity is evaluated by the amount of soil disturbance associated with timber harvest and road building. Soil erosion is evaluated by considering the acres of soil exposed in timber harvest units and the potential for landsliding or mass movement from timber harvest and road building.

Soil Productivity

Soil Disturbance

Generally, the more acres harvested the more potential there is for soil disturbance. Soil disturbance can reduce soil productivity by compacting or displacing the soil. Observations on the Ketchikan Area indicate that disturbance is related to the type of yarding that occurs at a harvest unit. Table 4-2 shows potential acres of soil disturbance by alternative based on

acres harvested and logging system as presented in Appendix B. The values shown are based on preliminary observations, but they provide an index to allow comparison of alternatives. These values are all below the 15-percent soil disturbance threshold established in FSM 2500. Helicopter, partial or full suspension, and other logging systems are assumed to produce 1, 6, and 12 percent soil disturbance, respectively, based on observations of harvest units in the Ketchikan Area (Forest Service 1993b). Soil disturbance ranges from 244 to 336 acres or 6 to 9 percent of the total acres harvested. Alternative 4 has the most acres disturbed while Alternative F5 has the least. Any impairments to soil productivity would be reduced as the site is revegetated. Consequently, effects beyond 5 to 10 years would be small.

Table 4-2

Estimated Acres of Soil Disturbance in Harvest Units for the Action Alternatives (in acres)

	Alternative F2	Alternative 3	Alternative 4	Alternative F5
Helicopter[1/]	11	18	5	8
Partial/Full[2/]	73	67	81	64
Other[3/]	196	218	250	172
Total	280	303	336	244
% of Total Acreage	7	6	9	7

SOURCE: Stewart 1993

1/ Assumes 1 percent soil disturbance
2/ Assumes 6 percent soil disturbance
3/ Assumes 12 percent soil disturbance

Road Construction Acreage

The construction of roads, landings, and excavation of quarries removes soil from the forest land base. Assuming a 75-foot disturbed road corridor, each mile of road would cut, fill, or otherwise disturb approximately 9 acres of land. Approximately, 1.5 acres of soil are disturbed for the average quarry, which supplies rock for approximately 2 miles of road. Additionally, the one or more landings per unit would require about 0.2 to 2 acres depending on the logging system and the number of settings. As a worst-case analysis, all of this land is considered to be permanently taken out of production. Table 4-3 shows the acres of road-associated disturbance, including quarries and landings, for the action alternatives. Alternatives 3 and 4 have the highest acreage of road-associated disturbance followed by Alternative F2 and Alternative F5.

Roads can be a significant source of sediment to streams. The potential for sediment delivery from roads is considered in more detail in the *Water, Fish, and Fisheries* section of this chapter.

Soil Erosion

Surface Erosion

Soil disturbance during timber harvest can reduce the ability of the organic mat and the mineral soil to absorb water, thereby making increased surface erosion possible. Soil disturbance and associated soil erosion can contribute to reduced soil productivity. This effect will occur for a short period of time until the site is revegetated, typically three to five years. The acres of potential soil disturbance are shown in Table 4-2.

Table 4-3
Acreage of Road-, Quarry-, and Landing-Associated Disturbance by VCU and Alternative

VCU	Alternative F2	Alternative 3	Alternative 4	Alternative F5
611	0	41	0	0
612	64	37	88	64
613	67	52	76	67
618	0	0	18	0
619	20	0	20	19
620	116	67	84	84
621	103	221	170	102
622	14	66	54	4
624	34	45	19	34
674	2	0	18	0
675	0	54	0	0
Total Acres	420	583	547	374

SOURCE: Stewart 1993.

As stated under Soil Disturbance above, Alternative 4 has the most acres disturbed by timber harvest while Alternative F5 has the least. In general, surface soil erosion that occurs within timber harvest units has a limited possibility for contributing sediment to streams. The main BMP's to minimize soil disturbance near Class III streams are buffers, controlled felling of trees away from streams, and yarding these trees away from the streams (split yarding). Site-specific recommendations for controlled felling and split yarding are contained in the unit cards. The potential for sediment delivery from all harvest units to streams is considered in more detail in *Water, Fish, and Fisheries.*

Landslides

Landslides are most likely to occur when timber harvest and road construction occurs on very high MMI soils. The prefield and field verification processes eliminated all areas on very high MMI soils from the harvest units. In addition, during field verification logging road access to several areas indicated an unacceptable landslide risk to both the soil resource and the road. Timber harvest units beyond the roaded sites were prescribed for helicopter logging. These areas included the east side of Twelvemile Arm (Units 621-299, 311, and 310); the west (Units 613-218, 219, 221, and 228) and east side (Units 613-202, 205, 206, and 208) of Old Franks Creek; and the east side of McKenzie Inlet (Units 618-203, 205, 216, and 221). The acres of management activity on high MMI soils quantifies the areas most sensitive to mass movement. Table 4-4 shows by VCU and alternative the acreages of high MMI soils within harvest units and crossed by roads. For harvest units, Alternative F2 has the most high MMI soils and Alternative 3 has the least. Alternative 1a would result in approximately 1,060 acres of high MMI soils not being harvested. In relation to road construction, Alternative 4 has the highest acreage of high MMI soils and Alternative F5 has the lowest acreage.

Table 4-4
Acreage of Harvest Units and Roads on High MMI Soils

VCU	Alt. 1a Units	Alt. 1 Units	Alt. F2 Units	Alt. F2 Roads	Alt. 3 Units	Alt. 3 Roads	Alt. 4 Units	Alt. 4 Roads	Alt. F5 Units	Alt. F5 Roads
611	0	0	0	11	11	0	0	0	0	0
612	-5[1/]	0	120	24	37	15	157	32	120	24
613	0	0	500	24	448	10	296	17	500	24
618	-245	0	0	0	0	0	107	9	0	0
619	0	0	170	10	0	0	172	8	137	8
620	0	0	555	27	246	13	426	25	468	21
621	-80	0	378	35	521	50	368	41	335	39
622	-102	0	0	0	0	0	0	0	0	0
624	-628	0	79	5	79	6	79	6	79	0
674	0	0	24	1	0	0	142	30	0	0
675	0	0	0	0	138	29	0	0	0	0
Total	-1060	0	1,826	137	1,480	123	1,747	168	1,639	116

SOURCE: Stewart 1993.

1/ Negative numbers indicate reduced harvest relative to Alt. 1.

Mass wasting is a naturally occurring phenomenon in the Project Area (Swanston 1969); however, it is well known that timber harvest increases mass wasting frequency over natural background levels (Sidle et al. 1985). Mass wasting occurs when the gravitational force overcomes the cohesive strength of the soil. This may occur when local increases in the water table create increased pore water pressures that decrease the friction between soil particles to the point that they move downslope under the influence of gravity. This increase in pore water pressure is most common at the soil-till contact in soils developed on compact till. Timber harvest accelerates this process in two ways. First, transpiration is decreased with tree removal. This increases soil moisture and allows a higher rise in the water table for a given rainstorm, which is more likely to destabilize the slope. Second, tree removal ultimately results in the decay of tree roots. Tree roots add cohesion to the soil, which counteracts the increased pore pressure caused by rises in the water table. As the roots decay the added cohesion is lost and consequent increases in mass-wasting frequency begin about 3 to 7 years after harvest (Bishop and Stevens 1964, Sidle et al. 1985, Swanston and Marion 1991).

In late October 1993 after field verification for the Polk Inlet Project, a large rainstorm swept across central Prince of Wales Island. The storm produced a variety of flooding events and numerous debris torrents and debris avalanches on the Craig and Thorne Bay Ranger Districts. Several roads were blocked and houses were destroyed due to the landslides. New landslides occurred in Fubar Creek and in the Harris River valley in old-growth stands and in second-growth stands that had been harvested in the 1960's and 1970's.

The probable cause of these landslides is localized heavy precipitation resulting in rapid development of temporary high water tables in shallow soils (Forest Service 1994). Data from the Thorne Bay Ranger District indicates that the storm event caused more landslides in areas harvested between 1985 and 1993 than in second-growth or old-growth areas (Forest Service 1994). In that report, landslide rates for all harvested lands are 2.9 times greater than

for old-growth. This value is based on data that excludes small landslides less than 100 cubic yards or one-half acre, which cannot be systematically inventoried. This methodology is similar to that used by Swanston and Marion (1991), who evaluated mass-movement frequency under natural and harvest conditions throughout Southeast Alaska for a 20-year period (1963 to 1983). Their data showed that landslides on harvested lands were 3.5 times more likely to occur than in old-growth areas.

Swanston and Marion (1991) also found that only a small percentage of the sediment transported by these landslides reached streams. The landslide survey categorized 23 percent of all landslides as debris torrents that occur in deeply cut V-notch gullies. Long-term impacts (greater than 10 years) to channel form and function and to fish habitat would be anticipated for Class I channel segments directly affected by a large landslide (Hogan and Wilford 1989). Based on these results, there is about a one-in-four chance that any management-related landslide will have an impact on Class I streams and only a very slight chance that impacts on fish habitat could occur. It can be inferred that the majority of these landslides would affect primarily Class III stream channels, since only about three percent of all natural and management-induced slide events in this survey were shown to directly affect Class I streams. The potential for sediment delivery from all harvest units and all roads to streams is considered in more detail in Water, Fish, and Fisheries.

Cumulative Effects

Cumulative soil effects for the Project Area are estimated by assuming that approximately 64,975 acres would have been harvested and 11 percent of the suitable and available CFL would remain unharvested in the Project Area by 2054 (see Table 4-36). Approximately 158 miles of additional road would be needed to access this timber. Cumulative effects of these actions upon long-term soil productivity are directly related to the amount of soil disturbance that occurs through time and the amount of recovery that takes place in the soil system in that time. Soil disturbance, erosion, and the associated loss of productivity resulting from timber harvest activities will occur. These effects, however, will be minimal and short-term; they will only last until revegetation occurs subsequent to each entry. Revegetation will occur within 3 to 5 years of timber harvest.

The effects to the soil resource by mass movement can be evaluated by estimating the amount of timber harvest on high MMI soils that would occur between 1995 and 2054 (Figure 4-1). The total acres of high MMI soils are for the entire Project Area. The values for the period 1995 to 1998 are those of Alternative 3. Future harvest on high MMI soils is projected based on the 30 percent harvest on these soils that would occur by 1998. The 30 percent is applied to the acres harvested by decade for the Project Area taken from TLMP projections as described in Vegetation and Timber Resources. The amount of harvest on high MMI soils varies from 1 to 9 percent of the total per decade. The total harvest on high MMI by 2054 is projected as 19,607 acres or 45 percent of the total high MMI acres. Mass movement hazard peaks about 3 to 7 years after timber harvest as root strength decay weakens soil cohesion. As revegetation occurs and roots systems develop, soil cohesion increases and the mass movement hazard decreases. Consequently, after about 20 years from any individual entry, the decadal values in Figure 4-1 will not be cumulative. The cumulative effects, therefore, should be within acceptable threshold levels during the period 1995 to 2054.

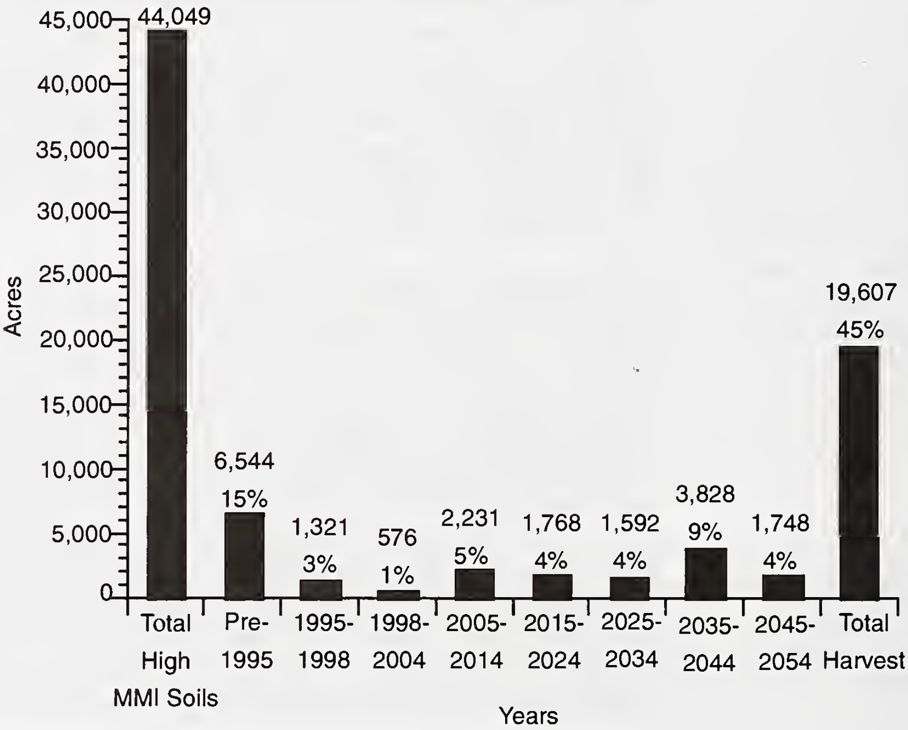
To minimize adverse soil effects, management activities during this interval will incorporate state-of-the-art soil conservation practices as they are developed and implemented. By maintaining soil productivity during this period, the cumulative effects of these actions will remain within soil productivity thresholds.

Mitigation

Mitigation for protecting the soil resource occurs through both planning and implementation. Mitigating the effects of timber harvest alternative on soils includes avoidance (for example, excluding road construction and timber harvest on unstable soils). Avoidance begins as planning-level mitigation through the soil survey of the area (Hamm et al. 1981), which provides a field reconnaissance of the soil resource and sensitive soil areas. For the Polk Inlet Project, this information, combined with vegetation mapping and aerial photograph interpretation, provided an initial level of screening for timber harvest unit and road placement which allowed avoidance of very high mass movement soils and wetlands. Field verification of the units and roads resulted in site-specific identification of very high mass movement soils and areas dominated by McGilvery soil. These observations resulted in the exclusion of such areas from harvest units and, in some cases, elimination of entire harvests (Mitigation Measure F1). Boundary adjustments for timber harvest units are shown on the unit cards. In addition, road access was prevented in several areas because of concern for the soil resource (Mitigation Measure F2). These areas included the east side of Twelvemile Arm, the west and east sides of Old Franks Lakes, and the east side of McKenzie Inlet. Harvest units in these areas were prescribed for helicopter yarding. Specific harvest units affected by these and other mitigation measures are identified in Appendix B.

Figure 4-1

Cumulative Acres of Timber Harvest on High Mass Movement Index Soils



SOURCE: Forest Service, Ketchikan Area, database.
* Represents percent of total acres of high MMI soils.

Another means of reducing landslide potential and to maintain long-term productivity is to require partial or full suspension on harvest unit areas that have high mass movement potential or McGilvery soils (Mitigation Measure F3). Harvest units with partial or full suspension requirements are detailed in Appendix B and on the unit cards.

Additional soil mitigation can also be provided during final harvest unit layout. A soil specialist will check off mitigation measures on the final unit and road cards. The sale administrator will be responsible for ensuring the implementation of contract items. If further field examination of the harvest units identifies areas with questionable stability or a high percentage of McGilvery soils, then additional site investigation by a soil resource specialist will occur and appropriate recommendations will be incorporated into the final unit design cards. If soil stability problems or questions arise during road construction and timber harvest, a soil resource specialist will investigate and provide prescriptions to deal with the specific situation. Additional mitigation measures to control erosion are discussed in the Water, Fish, and Fisheries section of this chapter.

Monitoring

Implementation monitoring for the soil resource is related to soils and to water quality issues. The timber sale contract administrator, as the person with day-to-day project contact, will be primarily responsible for ensuring the implementation of BMP's as stated in the unit cards. After avoidance of hazardous soil areas, the main BMP's to protect the soil resource are directional falling of trees away from streams and yarding trees away from streams (split yarding) to minimize soil disturbance near streams.

The forest-wide monitoring plan described in the TLMP Draft Revision (1991a), specifically addresses BMP monitoring (see Monitoring section in Water, Fish, and Fisheries). In addition, it describes a field monitoring activity directed at measuring the effectiveness of the standards and guidelines in preventing significant or permanent impairment of soil productivity (Watershed Monitoring Item 4).

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Wetlands, Floodplains, and Riparian Areas

Key Terms

Aquatic ecosystems—the stream channel, lake or estuary bed, water, biotic communities, and the habitat features that occur therein.
Estuarine—deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, but which have open, partly obstructed or sporadic access to the open ocean, and in which ocean water is diluted by freshwater runoff.
Hydrophytic vegetation—plants typically found in wetlands and dependent upon wetland moisture regimes for growth and reproduction.
Muskeg (peatlands)—a type of bog that has developed in depressions, or flat areas, poorly drained, acidic, with organic soils that support vegetation that is predominantly sphagnum mosses and heaths.
Primary succession—vegetation development that is initiated on surface exposed for the first time, which has never before supported vegetation.
Riparian areas—geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.
Riparian ecosystems—a transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.
Riparian management area—the area including water, land, and plants adjacent to perennial streams, lakes, and other bodies of water that is managed for the inherent qualities of the riparian ecosystem.
Secondary succession—the process of reestablishing vegetation after normal succession is disrupted by fire, cultivation, timber harvest, windthrow, or any similar disturbance.
Wetlands—areas that are inundated by surface or ground water with a frequency sufficient, under normal circumstances, to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Direct and Indirect Effects

Wetlands

Timber harvest and road construction will affect some wetlands. The amount, frequency, and distribution of wetlands in the Project Area make it impossible to avoid road construction on wetlands. Additionally, forested wetlands are an important component of the CFL base. The acreages of wetlands harvested by VCU and alternative is shown in Table 4-5. Field verification indicates that muskeg inclusions are less than 3 acres within any individual harvest unit. Total muskeg inclusions range from 40 to 96 acres for the action alternatives. Alternative 3 has the most muskeg inclusions, followed by Alternatives F2, F5, and 4. Alternative 1a would result in approximately 51 acres of muskeg inclusions not being affected.


Muskeg

Table 4-5
Wetlands Associated with Harvest Units by Alternative and VCU (in acres)

	Forested Wetlands & Muskegs[1/]					
VCU	Alt. 1a	Alt. 1	Alt. F2	Alt. 3	Alt. 4	Alt. F5
611	0	0	0	7	0	0
612	-15[2/]	0	285	3	285	285
613	-259	0	262	161	187	263
618	-52	0	0	0	0	0
619	0	0	124	0	117	100
620	0	0	407	188	301	339
621	-30	0	304	316	291	301
622	-257	0	67	114	1	49
624	-188	0	116	140	99	116
674	0	0	5	0	123	0
675	0	0	0	51	0	0
Total Forested	-801	0	1,570	980	1,404	1,453
Total Muskeg	-51	0	73	96	40	68
Total	-852	0	1,643	1,076	1,444	1,521

SOURCE: Forest Service, Ketchikan Area, database.

1/ Many of the wetlands in the Project Area occur in complexes with nonwetlands or other wetland types. A complex is an area of two or more different soil types that occur in a regularly repeating pattern that can be mapped on aerial photographs. Values for forested wetlands in this table were derived using percent composition of each soil type in the complexes mapped during the soil and vegetation survey. Values for muskegs started with GIS acreage which was modified based on field verification and aerial photograph interpretation.

2/ Negative numbers indicate reduced harvest relative to Alternative 1.

Forested wetlands within harvest units range from 980 to 1,570 acres. Of the action alternatives, Alternatives F2 and F5 have the most forested wetlands. Alternative 3 ranks the lowest and harvests a much smaller acreage of forested wetlands compared to the other alternatives. Alternative 1a would result in approximately 801 acres of forested wetland not being affected. Note that forested wetland acres are based on GIS analysis and are maximum values.

Timber harvest on forested wetlands will likely increase soil moisture because of reduced transpiration resulting from tree removal. This affect will occur until trees are re-established. Revegetation of forested wetland sites occurs in the same time frame as for other forested sites, usually within 3 to 5 years. Consequently, long-term effects to forested wetlands are expected to be minor. Timber site productivity on wetland soils, however, is typically lower than on better-drained sites. Growth rates on wetland sites are expected to be lower than on nonwetland sites, and merchantable timber may not be available in a 100-year rotation.

The most direct effect on wetlands would be the fill associated with road construction. The construction of roads would permanently remove the roaded portions of the wetlands from production thereby eliminating their biological functions. Table 4-6 shows the acres of road construction by wetland types for the alternatives. The average disturbance width is calculated at 75 feet; however, construction on wetlands is easier than on steep sideslopes and the actual width will be much less. Consequently, the road disturbance acres shown are maximum values. Alternative 3 has the highest, while Alternative 4 has the fewest acres of muskeg affected by road construction. Regarding forested wetlands, Alternative 4 has the most road disturbance acres, while Alternative 3 has the least.

Table 4-6

Road Construction on Wetlands by Alternative and VCU (in acres)

	Forested Wetlands & Muskegs[1/]					
VCU	Alt. 1a	Alt. 1	Alt. F2	Alt. 3	Alt. 4	Alt. F5
611	0[2/]	0	0	2	0	0
612	-32[2/]	0	52	0	52	52
613	-37	0	57	12	49	56
618	-21	0	0	0	1	0
619	0	0	13	0	7	7
620	0	0	55	35	35	41
621	-6	0	61	74	73	66
622	-33	0	1	3	3	2
624	-22	0	9	15	10	11
674	0	0	0	0	24	0
675	0	0	0	19	0	0
Total Forested	-151	0	248	160	254	235
Total Muskeg	-11	0	36	39	32	34
Total	-162	0	284	199	286	269

SOURCE: Forest Service, Ketchikan Area, database.

1/ Many of the wetlands in the Project Area occur in complexes with nonwetlands or other wetland types. A complex is an area of two or more different soil types that occur in a regularly repeating pattern that can be mapped on aerial photographs. Values in this table were derived using percent composition of each soil type in the complexes mapped during the soil and vegetation survey.

2/ Negative numbers indicate reduced acreage relative to Alternative 1.

Estuaries

Forest-wide standards and guidelines require that estuaries be buffered by a 1,000-foot no-harvest zone. Road construction should avoid this buffer but could occur when there is no suitable alternative. During prefield layout of roads and harvest units, estuarine buffers were avoided. The Polk Inlet Project has no proposed roads or timber harvest within the buffer, which eliminates any direct effects to the estuarine zone. Sediment from road construction and mass wasting that enters streams is eventually delivered to estuarine zones. As discussed

below in the sediment section, the amounts of such sediment are considered to be minimal. In addition, estuaries are natural deposition zones for fine-grained sediments and all aquatic organisms are adapted to this process. The small amounts of extra sediment that will be delivered because of road construction and timber harvest would have minimal biologic effects and would not adversely affect biotic populations.

Floodplains

The high density of streams in the Project Area precludes avoiding all floodplains during timber-harvest-related activities. Environmental consequences in floodplains are generally limited to road construction during which both direct and indirect impacts to floodplains could occur. To minimize adverse effects on floodplains, all bridges and culverts are sized so as not to impede floodwater. Consequently, there will be no loss of floodplain function under any of the action alternatives. There would be no human occupancy of floodplains as a result of any proposed alternative. The only floodplain development proposed in the alternatives is stream crossings. Because the Polk Inlet Project Area already has an existing road network, there are relatively few instances where new roads would cross Class I and II streams and their associated floodplains. Table 4-7 shows the number of floodplain road crossings of Class I and II streams by alternative. Harvest units associated with these crossings are also identified in Table 4-7. Road crossings of Class I and II streams range from 1 to 4 and 0 to 2, respectively. Alternative 3 has the most crossings of Class I and II streams while Alternative F5 has the fewest. The maximum length of floodplain crossings is less than 300 feet; consequently, there are fewer than 3 acres of affected floodplain in any action alternative.

Table 4-7
Number of Floodplain Road Crossings of Class I and II Streams by Alternative

	Alt. 1a	Alt. 1	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Class I[1/]	8	0	1	4	1	1
Class II[2/]	0	0	2	2	2	0
Total	8	0	3	6	3	1

SOURCE: Forest Service, Ketchikan Area, database.

1/ Class I floodplain crossings are associated with Harvest Units 611-215, 612-230, 622-212, 624-203, and 675-235.

2/ Class II floodplain crossings are associated with Harvest Units 621-246 and 622-264.

Riparian Management Areas

The amount of riparian management area harvested by stream class, VCU, and alternative is shown in Table 4-8. The acreages shown under the heading Class I are for harvest within the 400-foot selective-cut buffer adjacent to lakes. No timber harvest will occur within the 100-foot minimum TTRA buffers of Class I streams. The largest harvest acreage within the riparian management area is for Class III streams. Alternative 3 has the largest number of acres of harvest within the riparian management area while Alternative F2 has the least.

Table 4-8
Riparian Management Area Harvested by Stream Class and VCU for the Action Alternatives (in acres)

Alternative F2

VCU	Class I	Class II	Class III	Riparian Soils	MMI4	
611	0	0	0	0	0	
612	8	0	34	0	0	
613	15	1	90	0	0	
618	0	0	0	0	0	
619	11	1	19	0	0	
620	17	1	109	0	0	
621	0	8	37	0	0	
622	12	4	8	0	0	
624	2	0	29	0	0	
674	0	0	5	0	0	
675	0	0	0	0	0	
Total	65	15	331	0	0	411

Alternative 3

VCU	Class I	Class II	Class III	Riparian Soils	MMI4	
611	0	0	8	0	0	
612	2	0	25	0	0	
613	5	1	202	0	0	
618	0	0	0	0	0	
619	0	0	0	0	0	
620	14	0	43	0	0	
621	0	8	150	0	0	
622	12	4	47	0	0	
624	2	0	48	0	0	
674	0	0	0	0	0	
675	2	1	31	0	0	
Total	37	14	554	0	0	605

Table 4-8 (continued)

Riparian Management Area Harvested by Stream Class and VCU for the Action Alternatives (in acres)

Alternative 4

VCU	Class I	Class II	Class III	Riparian Soils	MMI4	
611	0	0	0	0	0	
612	10	0	59	0	0	
613	14	2	79	0	0	
618	0	0	30	0	0	
619	1	3	19	0	0	
620	17	1	88	0	0	
621	0	8	66	0	0	
622	11	3	9	0	0	
624	2	0	35	0	0	
674	3	0	2	0	0	
675	0	0	0	0	0	
Total	58	17	387	0	0	462

Alternative F5

VCU	Class I	Class II	Class III	Riparian Soils	MMI4	
611	0	0	0	0	0	
612	8	0	34	0	0	
613	15	1	71	0	0	
618	0	0	3	0	0	
619	1	3	17	0	0	
620	7	1	67	0	0	
621	0	8	30	0	0	
622	1	1	8	0	0	
624	2	0	29	0	0	
674	0	0	0	0	0	
675	0	0	0	0	0	
Total	34	14	259	0	0	307

SOURCE: Forest Service, Ketchikan Area, database

Timber harvest within the riparian management area within individual VCU's varies from 0 to 202 acres. Generally, the riparian management area harvested within a VCU is widely distributed. For example, though VCU 621 has 150 acres of harvest in Alternative 3, these units are

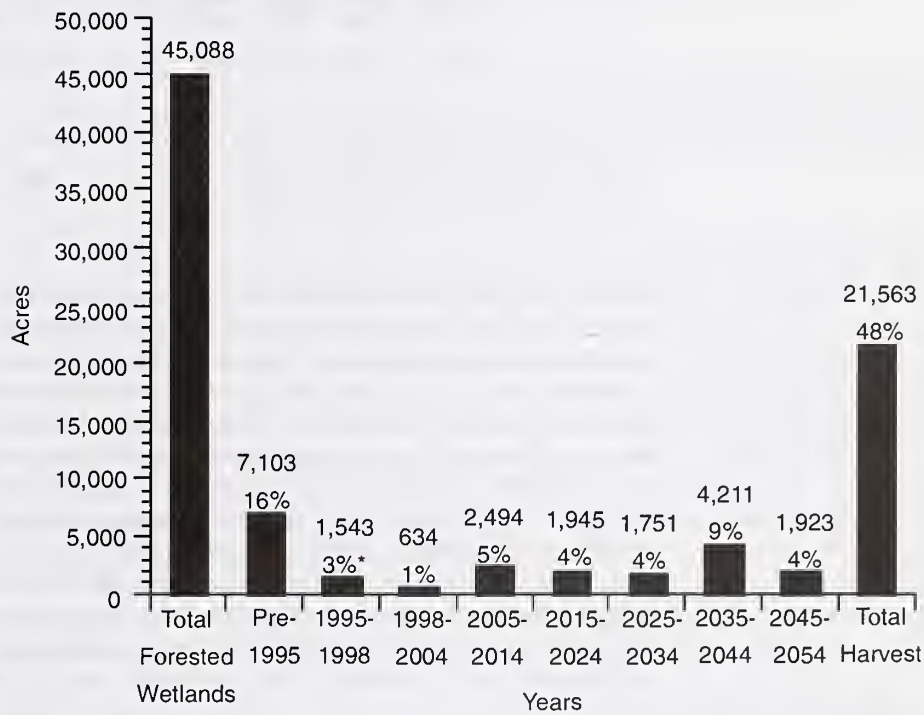
dispersed and many of them are along Twelvemile Arm draining directly into saltwater. Consequently, the potential impact to any Class I stream below the harvest units is minor. Harvest within VCU 613 (Old Franks drainage) varies from 79 (Alternative 4) to 202 acres (Alternative 3). This drainage has the highest concentration of timber harvest within the riparian management area of any VCU.

The effects of riparian area harvest are related to water quality, and fish and wildlife habitat. Consequently, the effects of riparian harvest are discussed in more detail in *Water, Fish, and Fisheries* and *Wildlife*.

Cumulative Effects

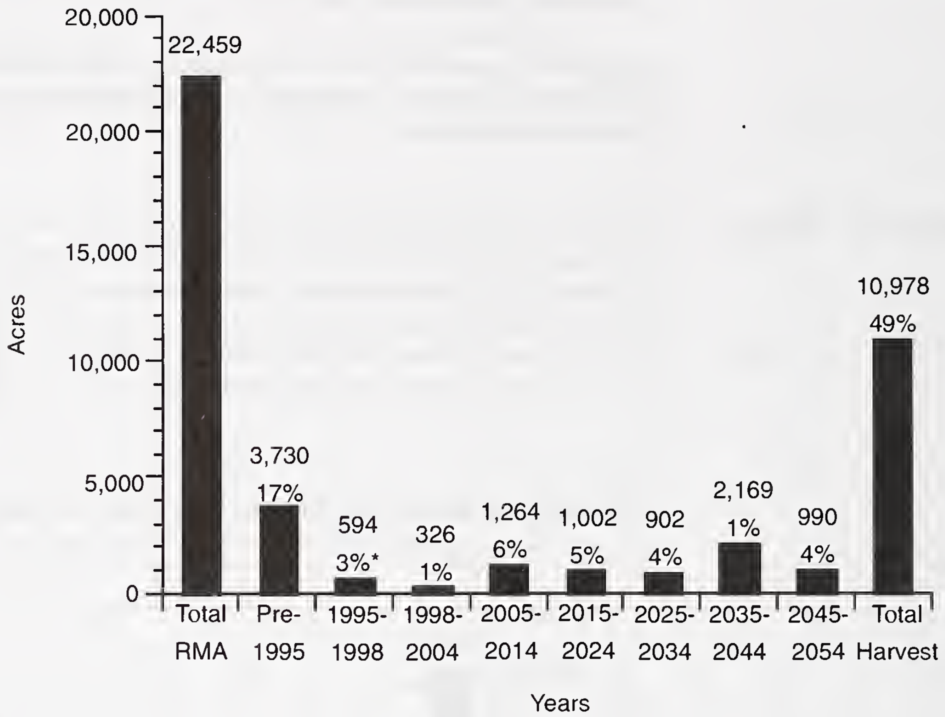
Cumulative forested wetland and riparian management area effects are estimated by assuming that approximately 64,975 acres would have been harvested and 11 percent of the suitable and available CFL remain unharvested in the Project Area by 2054 (see Table 4-36). Approximately 158 miles of road would be needed to access this timber. The effects to these resources can be evaluated by estimating the amount of harvest on forested wetlands and riparian areas that would occur between 1994 and 2054 (Figures 4-2 and 4-3).

Figure 4-2
Cumulative Acres of Timber Harvest in Forested Wetlands



SOURCE: Forest Service, Ketchikan Area, database.
* Represents percent of total forested wetlands.

Figure 4-3
Cumulative Acres of Timber Harvest in Riparian Management Areas



SOURCE: Forest Service, Ketchikan Area, database.
* Represents percent of total Riparian Management Area.

The total acres of forested wetlands and riparian area in Figures 4-2 and 4-3 are for the entire Project Area. Note that the total acres of forested wetlands are based on GIS analysis and are maximum values (see *Wetlands, Floodplains, and Riparian Areas* in Chapter 3). The values for riparian area do not account for any additional buffers that might be applied in the field. The values for the period 1994 to 1997 are those of Alternative 3 which has the most acres of harvest on these sites. Future harvest on forested wetlands and riparian management areas are projected based on the 33 and 17 percent harvest, respectively, on these sites that would occur by 1997. The percentage is applied to the acres harvested by decade taken from TLMP projections as described in *Vegetation and Timber Resources*. The harvest on forested wetlands and riparian areas by 2054 is projected at 21,563 and 10,978 acres, respectively. The amount of harvest on these sites ranges from 3 to 14 percent per decade. Acres of muskeg within harvest units would be similar to this entry. Perhaps 100 acres of muskeg would occur within harvest units in each entry for a total of 700 acres by 2054.

The cumulative effects of this harvest to forested wetlands is anticipated to be minimal. Revegetation of forested wetlands sites occurs in the same timeframe as other forested sites, usually within 3 to 5 years. Consequently, long-term effects to forested wetlands are expected to be minor. Since growth rates on wetland sites are expected to be lower than on nonwetland sites, merchantable timber from these acreages may not be available in a 100-year rotation.

Road construction on wetland sites will use culverts to minimize disruption of water flow and permeable subgrade materials to avoid restricting the natural movement of water. These measures will ensure that the hydrological, chemical, and biological functions of wetlands would be minimally impaired. The roadbed overlying wetlands will remove that area from production and eliminate their biological functions. Alternative 3 involves 58 miles of road construction/reconstruction of which approximately 29 percent is on forested wetlands or muskegs. Projecting this same ratio, the estimated 158 miles of road needed to access the available timber would cover approximately 46 miles or 418 acres of forested wetland and muskeg. Again, the values for forested wetlands are based on GIS analysis and are maximum values.

Mitigation

Mitigation measures designed to protect wetland areas involved the avoidance, to the extent possible, of muskegs during office and field layout of harvest units and roads, and, in some cases, the addition of suspension requirements during logging (Mitigation Measure F4). Harvest units affected by this mitigation measure are identified in Appendix B and on the unit cards. Field layout of road systems allowed site-specific identification of small drainages in wetlands requiring culverts and the road segments requiring additional culverts and permeable subgrades to maintain water circulation. Culverts and permeable subgrade materials are required when roads cross wetlands; these road segments are identified on the road design cards (Mitigation Measure F8). Additionally, the use of BMP's in both construction and maintenance ensures that flows, circulation patterns, and chemical and biological characteristics of the wetlands' water would be minimally impaired. These procedures would maintain the physical and chemical functions of wetlands (EPA 1993).

Floodplains will not be harvested because they are generally part of the riparian buffer of Class 1 streams. Road systems, however, will cross floodplains. To minimize adverse effects, the frequent placement of culverts is indicated on the Road Cards. These culverts will prevent the road prism from inhibiting the flow of floodwaters (EPA 1993).

Mitigation measures designed to protect riparian areas are based on TLMP Draft Revision standards and guidelines (TLMP Draft Revision 1991a), the riparian management area definition, the associated planning level buffer prescriptions (Appendix C), and the site-specific buffers prescribed in the field (Appendix C). The prescription of buffers in the field is the most important mitigation measure because it ensures the location and evaluation of all streams in the harvest units. This field verification identified all Class I streams and Class II streams that flow into Class I streams and prescribed the appropriate buffer (Mitigation Measure F5). This procedure allowed the avoidance of the riparian area adjacent to previously unknown Class I and II streams. Additionally, field verification allowed the identification of numerous previously unmapped Class II and III streams and prescribed directional falling and split yarding of trees away from the stream (Mitigation Measure F6). In some cases, buffers were prescribed for Class III streams because of the presence of deep soils along steep V-notches which could contribute sediment to the stream (Mitigation Measure F7). Appendix B and the unit cards identify which mitigation measures apply to each harvest unit.

Buffers for Class I and Class II streams which flow into Class I streams are susceptible to blowdown after harvest. At present, generally accepted and readily applicable rules for designing windfirm buffers adjacent to streams do not exist. The Ketchikan Area is currently monitoring blowdown in stream buffers (Forest Service 1992j). One function of no-harvest buffers on Class I streams is to maintain the supply of large woody debris to the stream. Windthrow is the most common source of natural large woody debris loading (Gregory and Ashkenas undated). Consequently, the blowdown of portions of buffer strips merely changes the timing of debris input (Gregory and Ashkenas undated). Catastrophic blowdown of long

lengths of buffer on Class I streams could reduce long-term input of LWD. If catastrophic blowdown creates a detrimental condition, e.g., barriers to anadromous fish, modification of the debris accumulation should be considered on a case-by-case basis.

Stream buffer and BMP information tabulated from field verification are shown in Tables 4-9 and 4-10. Table 4-9 summarizes information on the length of 100-foot TTRA and extended width stream buffers by stream class and alternative. Table 4-10 summarizes information on the lengths of Class III streams that would be harvested to streambank and that received a no-cut buffer. Note that the values in these tables can double-count a stream length depending on its location in a unit. For example, a Class I stream that forms a unit boundary would receive a buffer only on one side, while a Class I stream within a unit would receive a buffer on both sides.

Table 4-9

Lengths (in 1,000 feet) of Stream Buffer Applied by Stream Class by Alternative

AHMU Class	100-foot TTRA Buffer One Side	100-foot TTRA Buffer Both Sides	Extended Width Buffer [1/] One Side	Extended Width Buffer [1/] Both Sides
Alternative F2				
Class I	4.5	1.9	6.0	0.0
Class II[2/]	14.6	0.8	11.3	0.5
Alternative 3				
Class I	6.5	2.7	1.3	0.4
Class II	13.0	2.6	13.0	0.0
Alternative 4				
Class I	6.5	1.6	4.7	0.0
Class II	13.8	2.6	7.9	0.5
Alternative F5				
Class I	4.5	1.9	4.3	0.0
Class II	9.7	0.8	5.5	0.0

SOURCE: Forest Service, Ketchikan Area, database.

1/ Extended-width buffers average approximately 175 feet on each side of the stream.

2/ An additional 5,200 feet (.98 miles) of AHMU Class II streams running directly into saltwater but outside the beach/estuary fringe would receive no buffer or only a partial buffer and would be treated with BMP's.

Table 4-10

Lengths of Class III Streams (in 1,000 feet) Treated With Best Management Practices (BMP's), by Alternative

	BMP'S Excluding No-Cut Buffers[1/]		BMP's Including No-cut Buffers of Variable Width [2/]	
AHMU Class	One Side	Both Sides	One Side	Both Sides
Alternative F2	16.7	56.5	7.2	5.1
Alternative 3	11.8	105.2	5.2	3.7
Alternative 4	15.9	74.8	7.5	8.7
Alternative F5	11.9	42.6	6.2	4.4

SOURCE: Forest Service, Ketchikan Area, database.

1/ BMP's for Class III streams allow harvest to streambank and include split yarding away from streams, partial or full suspension over streams, and other measures to reduce streambank disturbance and maintain water quality.

2/ Variable width buffers average approximately 35 feet on each side of the stream. Variable width buffers are applied to those Class III stream channels requiring additional sideslope and bank protection based on analysis.

Monitoring

Routine implementation monitoring will be conducted by the timber sale administrator and road inspectors, who will be primarily responsible for ensuring the implementation of procedures specified on the unit and road cards. Culverts, permeable subgrade materials, buffers, and controlled felling and yarding of trees away from streams are the BMP's designed to protect wetlands, floodplains, and riparian areas.

The Polk Inlet Project Area provides opportunity for long-term monitoring of riparian management areas and associated aquatic habitat. Early studies and documentation of conditions in the Maybeso Experimental Forest, the Harris River, Twelvemile Creek, and the Old Tom Research Natural Area were presented in James (1956) and Meehan et al. (1969). Subsequently, Bryant (1980, 1985) studied LWD in many of these rivers. Consequently, there is a longer record of conditions here than in most areas of the Tongass National Forest.

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Water, Fish, and Fisheries

Key Terms

Alevin—newly hatched salmon that are still attached to the yolk sac.
Anadromous—fish that ascend from the sea to breed in freshwater streams.
Aquatic Habitat Management Unit (AHMU)—areas for managing the resources associated with streams and lakes.
Best Management Practices (BMP's)—land management methods, measures or practices intended to minimize or reduce water pollution.
Channel types—the defining of stream sections based on watershed runoff, landform relief, and geology.
Estuary—relatively flat, intertidal, and upland areas where saltwater meets fresh water, as at the heads of bays and the mouths of streams.
Large woody debris (LWD)—any large piece of relatively stable woody material having a diameter of at least 10 centimeters and a length greater than 1 meter that intrudes into a stream channel; also called Large Organic Debris (LOD).
Management Indicator Species (MIS)—species whose population changes are believed to best indicate the effects of land management activities; fish MIS in the Polk Inlet Project Area are coho and pinksalmon and Dolly Varden char.
Mitigation—measures designed to counteract environmental impacts or to make impacts less severe.
Resident fish—nonmigratory fish that complete their entire life cycle in fresh water.
Salmonid—refers to the group of fishes to which salmon belong.
Sediment—water-transported earth materials.
V-notch—a deeply incised, narrow valley along a drainage with a characteristic "V" shaped cross-section.
Watershed—area that contributes runoff water to a waterway.

Direct and Indirect Effects to Water Resources

Effects to water resources are discussed below in regard to hydrology, water quality, and consumptive water uses.

Water Resources Hydrology

Timber harvest alters basin hydrology because it affects transpiration, the interception and evaporation of rainfall, snow accumulation and melt, and soil structure and resultant water infiltration and transmission rates (MacDonald 1991). Though changes in streamflow are expected, their direction and magnitude vary and specific effects are not easily predictable. Generally, the larger the percentage of a watershed harvested, the greater the effects on streamflow. A harvest of approximately 25 to 35 percent of basin area is required within a period of 5 to 15 years before effects on mainstem flow are noted (Rothacher 1970, 1973; Harr et al. 1979; Duncan 1986). A study of the response of the Maybeso watershed to timber harvest showed no significant changes in streamflow when 25 percent of the basin was harvested (James 1956, Meehan et al. 1969). An analysis of the Staney Creek basin on Prince of Wales Island showed increases in mean and summer low flows (base flow) when harvest reached between 20 to 25 percent of the basin (Bartos 1989).

Though timber harvest has generally been shown to produce increases in streamflow, Hicks et al. (1991) present long-term data from central Oregon that shows decreases in flow during summer low flow periods. In a 100 percent harvested, 237-acre watershed, water yield increased above that of a control watershed for approximately 8 years. For the next 19 years of record, late summer water yield decreased below that of the control watershed. Hicks et al. (1991) consider this decrease to be caused by the dominance of alder in the riparian zone. This dominance produced an increase in transpiration over that of conifer-dominated vegetation. In the same study, a 25 percent patch-cut, 249-acre watershed showed increases in late summer water yield for 16 years after harvesting, returning to preharvest levels for the next 10 years of record. Besides the smaller percentage of harvest, the riparian zone of this watershed was not dominated by alder after harvest (Hicks et al. 1991). Similar effects are not documented in Southeast Alaska.

Rapid melting of shallow snowpacks by rainstorms could result in higher rates of water input to soil and streams than would occur during rainstorms alone. The elevational range over which snow might accumulate and melt, perhaps several times in one season, is known as the transient snow zone. Studies in Oregon, Washington, and southwestern British Columbia show that timber harvest in the transient snow zone could increase the magnitude and peaks of winter runoff (Harr 1986, Harr et al. 1989, Golding 1987).

Although timber harvest usually increases runoff and peak flows, Cheng (1988) documented the opposite effect in southern British Columbia. In that case, logging had compacted the soil, delayed water infiltration, and slowed water transmission through soil macropores.

Streamflow increases from timber harvest which could significantly affect sediment transport are not expected to occur in the Project Area. Cumulative watershed areas harvested within this entry range from 0 to 34 percent (see *Cumulative Effects* section). Four watersheds (Goose Bay, and Dog Salmon, Old Franks, and Cabin Creeks) have percentage harvests near or greater than 20 percent. These basins may experience increases in low to moderate stream discharge quantities.

Decreases in late summer low flows are not anticipated from the harvesting that occurs during this entry in the Project Area. Harvest levels of 100 percent at one entry, such as the harvest that produced the low flows documented by Hicks et al. (1991), will not occur. Harvest rates are restricted to 35 percent over a 15-year period and most watersheds are not close to the upper threshold (see *Cumulative Effects* section). In addition, alder domination of regrowth tends to occur on floodplain sites where ground disturbance allows its seeds to germinate on bare mineral soil. As noted in the *Floodplains* section, floodplains are predominantly associated with Class I, and to a lesser extent with Class II, streams. The placement of no-harvest TTRA buffers on Class I streams, and 100-foot buffers on most Class II streams, means that there will be minimal chance of alder invasion on floodplains. Late summer low flows may be reduced over background levels in watersheds that were harvested prior to the establishment of Standards and Guidelines, which prohibit harvest on floodplain soils. These effects might occur in watersheds of the Maybeso and Trocadero creeks and Harris River, which have floodplains that now have a significant alder component. Because Southeast Alaska has a higher precipitation regime and lower summer air temperatures than central Oregon, effects in this region are expected to be less. Alder can become established in the riparian zone of Class III streams after timber harvest if mineral soils are exposed. Present yarding specifications for Class III streams are sufficient to maintain ground cover soil quality standards that will prevent alder domination of these sites.

Water Quality

Water quality is discussed in regard to stream sediment, water chemistry, and stream temperature and dissolved oxygen. In addition, the action alternatives would result in a continued supply of raw wood products to the Ketchikan Pulp Company (KPC) mill at Ketchikan. This would indirectly affect water quality at Ward Cove in the vicinity of Ketchikan. It is KPC's responsibility to ensure that emissions from the mill are within legal limits.

Stream Sediment

Construction of new roads and removal of vegetation exposes soil and roadbed materials to erosion which increases sediment delivery to streams. The largest component of management-caused sediment input to streams is from roads (Reid and Dunne 1984), although harvest units also contribute. Specific quantities of sediment cannot be predicted; consequently, three methods are used to evaluate the alternatives and their relative risk of sediment delivery to streams. First is the acres of new road proposed for each alternative. Second is the number of road crossings of streams proposed for each alternative. Third is an evaluation of the specific potential for sediment delivery to streams of all roads and harvest units. The acres of new road proposed by VCU including quarries and landings are shown in Table 4-3. This shows that Alternatives 3 and 4 have the most new road acres and the highest potential risk for sediment delivery to streams. Alternative F5 has the least road acres.

The number of road crossings of streams by alternative is shown in Table 4-11. This analysis shows that Alternatives 3 and 4 have the highest number of crossings, and the highest potential risk for sediment delivery to streams.

Table 4-11
Number of Road Crossings of Class I, II, and III Streams by Alternative

	Alt. 1a	Alt. 1	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Class I	-11	0	3	12	9	5
Class II	-5	0	10	10	10	4
Class III	-32	0	88	127	124	75
Total	-48	0	101	149	143	84

SOURCE: Forest Service, Ketchikan Area, database.

The potential for sediment delivery to Class I streams was also considered by analyzing all harvest units and road segments using a method based on Hogan and Wilford (1989). This qualitative evaluation considered such factors as the number of streams, proximity to Class I streams, slope steepness, sediment delivery potential, and logging system. Each unit and road segment was ranked based on these parameters with values between 0 and 3, and the results tabulated. Details of the procedure and results for all harvest units and road segments are in Baker and Stewart (1993). For harvest units, the analysis indicates that Alternative F5 has the lowest potential for contributing sediment to streams (Table 4-12), while Alternative 3 has the highest potential. For roads, the analysis also indicates that Alternative F5 has the lowest potential for contributing sediment to streams while Alternatives 3 and 4 have the highest sediment delivery potential.

Table 4-12
Sediment Delivery Potential of Harvest Units and Roads for the Alternatives

	Alternative F2	Alternative 3	Alternative 4	Alternative F5
Sediment Delivery Index[1/]	412	493	449	343

SOURCE: Baker and Stewart (1993).

1/ This index was developed based on such factors as the number of streams, proximity to Class I streams, slope steepness, sediment delivery potential, and logging system. Each unit and road segment was ranked with values between 0 and 3 based on these parameters, and the results tabulated. Details of the procedure and results for all harvest units and road segments are in Baker and Stewart (1993).

While large amounts of sediment entering streams (beyond the stream's ability to store and transport it) are potentially harmful, the documented rates of sediment delivery when timber harvest includes use of BMP's (Mitigation Measures F2, F5, F6, F7, F8) are within the range of normal baseline conditions of streams in Southeast Alaska (Paustian 1987). Sediment delivery to streams under all action alternatives is not expected to significantly affect water quality.

Fubar Creek, which drains to the Harris River, is on the State of Alaska impaired water body list prepared under the Clean Water Act Section 305(b) and 303(d) (impaired). Previous landslides associated with timber harvesting in the 1960's contributed sediment to the stream. New landslide activity has occurred within the Fubar Creek drainage associated with the October 1993 storm system after field verification was performed though no detailed data exist on stream channel effects. Because of the potential sediment influx associated with this renewed slide activity, and the fact that Fubar Creek is on the impaired waters list, harvest units within the Fubar Creek drainage are no longer in Alternatives F2 and F5. The Fubar Creek units remain in Alternatives 3 and 4. If timber harvest activity occurs in the Fubar Creek drainage, a more detailed evaluation of the sediment delivery to the creek will be conducted.

Water Chemistry
Significant alterations to water chemistry as a result of timber harvest are not expected under any of the action alternatives. The use of motor vehicles and motor-driven timber harvest equipment means there is potential for fuel spills which might reach streams. Seeding and fertilizing road cutslopes for erosion control may allow the influx of fertilizer to stream systems. Under normal operating conditions, these nontimber harvest actions are expected to have only a minor potential to affect water quality, and water quality standards will not be exceeded.

Stream Temperature and Dissolved Oxygen
Timber harvesting in Class III riparian areas is expected to have minimal effects on stream temperature and dissolved oxygen. The maintenance of minimum 100-foot buffers on Class I and many Class II streams should substantially mitigate the downstream effects of any stream temperature increases occurring in the Class III streams. Stream temperatures in the Project Area seldom exceed the State standard of a maximum 68°F. The effects of removing a small area of streamside vegetation are generally negligible. Lower elevation streams with a southerly aspect would experience greater temperature changes than higher elevation streams

with a northerly exposure. Significant decreases in dissolved oxygen because of increased stream or lake temperatures are not expected. The application of appropriate stream buffers and other BMP's would maintain sufficient stream and lake canopy closure and mitigate any potential for significant temperature increases.

The potential effects on stream temperature among the alternatives were evaluated by considering the miles of vegetation removed alongside Class II and III streams in all timber harvest units (Table 4-13). Additionally, the miles of vegetation removed alongside Class I, II, and III streams in road crossings outside of timber harvest units is included in Table 4-13. For this analysis, roads are assumed to remove an average 75-foot strip of streamside vegetation when they cross streams. This data quantifies the total amount of stream channel subject to increased insolation and warming.

Table 4-13

Miles of Unbuffered Class II and III Streams[1/] within Harvest Units by VCU, Plus Miles of Road Crossings of Class I, II, and III Streams Outside Harvest Units for Each Action Alternative

VCU	Alternative F2	Alternative 3	Alternative 4	Alternative F5
Inside Units				
610	0.0	0.0	0.0	0.0
611	0.0	0.6	0.0	0.0
612	1.3	1.2	2.5	1.3
613	3.7	7.6	3.0	3.1
618	0.0	0.0	1.3	0.0
619	1.3 (0.1)	0.0	1.3 (0.1)	0.8 (0.1)
620	4.7	2.3	3.5	3.5
621	2.7(0.7)	7.2 (0.7)	4.1(0.7)	2.4 (0.7)
622	1.1	1.9	0.8	0.4
624	1.3	1.7	1.6	1.3
674	0.0	0.0	3.1	0.0
675	0.0	1.6	0.0	0.0
Total (II and III)	16.9	24.8	22.0	13.6
Outside Units	1.0	1.3	1.3	0.6
Total	17.9	26.1	23.3	14.2

SOURCE: Forest Service, Ketchikan Area, database.

NOTE: Class II streams are indicated in parentheses.

1/ These distances consider whether one side or both sides of a stream are harvested. If both sides are harvested, the stream's length is doubled.

These totals show a range of vegetation removal along streams between 14.2 and 26.1 miles. Alternative 3 has the most vegetation removal while Alternative F5 has the least. Approximately 95 percent of the affected mileage is in Class III steams for all alternatives. This is because the number of Class II streams running directly to saltwater and not requiring

minimum Tongass Timber Reform Act (TTRA) 100-foot buffers is small. The affected mileage compares to 379 total miles of Class III streams in the GIS database for the Polk Inlet Project Area. The affected mileage is also dispersed throughout watersheds. Most Class III streams in the Project Area are high gradient, contained channels with low temperatures even in summer. These properties make them resistant to thermal increases. For all of these reasons, stream temperature increases from removal of streamside vegetation in Class II and III streams in harvest units are unlikely.

Consumptive Water Use

The action alternatives would not have any impact on the availability of water to those sites in the Project Area where consumptive water use occurs. No harvest is planned for the watersheds near Hollis. Timber harvest in lower Polk Inlet would not affect the water supply or water quality at the floating logging camp or the Forest Service facility. Timber harvest in the Sunny Creek and Cannery Creek watersheds would not affect the availability of water to the homes at those sites.

Road construction at Sunny Creek and Cannery Creek would cross the upper portion of the small drainages that provide their water supplies. These crossings would occur in Alternatives 3 and 4, respectively. During field layout of the roads at these sites, no evidence was noted of the in-stream pipes which deliver water to the residential areas. Consequently, the road cards for these segments indicate that these pipes would be located during final road layout and site-specific measures to protect them would be implemented. Additional erosion control measures and care may be necessary at these sites in order to maintain State Water Quality Standards for drinking water during construction.

Direct and Indirect Effects to Fish and Fisheries

Because of mitigative actions taken and planned for implementation, no anticipated significant impacts will occur to fisheries resources from any of the alternatives. The remaining environmental effects of timber harvest and road construction on fish and fisheries resources may be either direct, indirect, or cumulative. Actions that have effects on fish include removal of riparian vegetation, increased sediment inputs to streams, temperature and dissolved oxygen changes, changes in inputs of large woody debris (LWD), and miscellaneous actions related to road construction. All of the action alternatives have some associated risk of effects to streams and fisheries resources; the magnitude of risk is generally proportional to the extent of application of stream buffer prescriptions and BMP's, the miles of new or reconstructed road, and the number of stream crossings required.

Removal of Riparian Vegetation in the Riparian Management Area

The effects on fisheries from removal of riparian management area under any alternative are small because the overall reduction in riparian areas in any of the areas that are likely to directly or indirectly affect fish is small. Marked reduction of riparian vegetation can have several indirect adverse effects on fish resources, including reduction in LWD which is important for rearing fish habitat, increased sediment input causing reduced fish production, and altered stream temperature which influence survival and growth of fish in streams and lakes (see *Water, Fish, and Fisheries* in Chapter 3). The buffers established under TTRA and expanded-width buffers mitigate most adverse effects to streams from riparian harvest for all alternatives. To evaluate the effects on harvest riparian areas on fisheries resources, several factors were considered, including: 1) miles of riparian habitat harvested (Table 4-13); 2) miles of riparian area outside of harvest units (Table 4-13); and 3) acres of riparian management area harvested (Table 4-8). Within the units, riparian harvest is relatively small with most

occurring along Class III streams, which do not have fish. Total management acres and miles of riparian area harvested is highest in Alternative 3 and lowest in Alternative F2 (Tables 4-8, 4-13). Acres and miles of riparian area removed from stream road crossings outside of the units is also small, with Alternatives 3 and 4 having the highest removal, and Alternative F5 the least (Table 4-13).

Sediment Inputs to Streams

Considering the protection built with TTRA and other expanded-width buffers and implementation of BMP's, none of the alternatives will significantly increase impacts to fisheries from increased sediment. However, risks from sediment still remain to these resources, with the highest risks occurring for alternatives with the greatest proportion of near stream disturbance and, secondarily, watershed disturbance (See Risks this section).

Increased sediment delivery may directly or indirectly adversely affect the survival of salmonids by factors such as reduced egg survival in stream gravel, reduced food supply, and direct mortality (see *Water, Fish, and Fisheries* in Chapter 3). Sediment input is affected by quantity of road miles, number of stream crossings, slope, total harvest acres and riparian harvest acres. The effects of the alternatives on these factors are discussed above under Water Quality in this section and in the *Riparian* section. As described above, timber harvest and road construction exposes soil and road surfaces to erosion which increases sediment delivery to streams.

The number of stream crossings (bridges and culverts) is an index used to assess the potential for erosion and increased sediment inputs to streams (see Water Quality above). Table 4-11 shows the number of stream crossings, by stream class, for the four action alternatives. Alternative 3 has the most Class I anadromous stream crossings, and Alternative F2 has the fewest.

Removal of riparian vegetation is indicated in Tables 4-8 and 4-13 by VCU. Based on the these tables, Alternative 3 would have the most and Alternative F5 the least effect on sediment input to streams from stream side vegetation removal.

The Water Quality section above ranks each of the alternatives based on overall sediment delivery potential to streams considering all major factors. Alternatives 3 and 4 have the highest overall potential for increased sediment delivery, and Alternatives F2 and F5 the least.

Fish Habitat

The habitat capability models indicate a slight decrease in potential production after 1995 for coho salmon and Dolly Varden char for all action alternatives (Tables 4-14, 4-15, and 4-16). Major increases in predicted production occur by 1995 and are the result of fish passage facility installations in Old Franks Creek, Dog Salmon Creek, Cable Creek, and Sunny Creek (see *Water, Fish, and Fisheries* in Chapter 3). The reduction in potential in some VCU's (e.g., VCU's 610, 621, 622) for coho and Dolly Varden over time is primarily the result of harvest that occurred between 1954 and 1979, not from the Polk Inlet Project. Timber harvest before 1980 included harvest in the riparian areas to the stream channel bank along anadromous and resident fish streams.

Table 4-14

Coho Salmon Habitat Capability (Smolt Production) and Percent Change from 1954 to 2145 by VCU

VCU	1954	1991	%[1/]	1995	%	2005	%	2115	%	2145	%
610	8,963	6,991	-22	6,696	-25	6,225	-31	5,180	-42	5,582	-38
611	0	0	0	0	0	0	0	0	0	0	0
612	9,091	9,091	0	9,091	0	9,091	0	9,091	0	9,091	0
613	13,989	13,989	0	65,563[2/]	+371	65,563	+371	65,563	+371	165,563	+371
618	11,974	11,831	-1	11,817	-1	11,795	-1	11,773	-2	11,782	-2
619	6,524	6,524	0	6,524	0	6,524	0	6,524	0	6,524	0
620	9,365	16,045[3/]	+71	16,024	+71	15,989	+71	15,952	+70	15,967	+70
621	8,174	7,022	-14	6,849	-16	6,574	-20	5,965	-27	6,197	-24
622	33,126	28,237	-15	27,503	-17	26,337	-20	23,685	-29	24,705	-25
624	16,510	18,886[4/]	+15	18,804	+14	18,674	+13	18,321	+11	18,411	+12
674	16,983	16,983	0	16,983	0	16,983	0	16,983	0	16,983	0
675	2,258	3,650[5/]	+62	3,650	+62	3,650	+62	3,650	+62	3,650	+62
Total	136,957	139,249	+2	189,504	+38	187,405	+37	182,687	+33	184,455	+35

SOURCE: TLMP 1990 Habitat Capability Model. Numbers also include smolt production in lakes.

1/ % = Percent difference between 1954 and indicated year.

2/ Installation of two fish passes in Old Franks drainage in 1992 increased predicted productivity. Increase based on data from Zadina and Haddix (1990) including lakes and streams in Old Franks system outside of Forest Service lands.

3/ Installation of the Dog Salmon River fish pass increased productivity.

4/ Installation of the Cable Creek fish pass increased productivity.

5/ Installation of the Sunny Creek fish pass increased productivity.

Table 4-15

Pink Salmon Habitat Capability (Smolt Production) and Percent Change from 1954 to 2145 by VCU

VCU	1954	1991	%[1/]	1995	%	2005	%	2115	%	2145	%
610	5,274,448	5,275,448	0	5,275,448	0	5,275,448	0	5,275,448	0	5,275,448	0
611[2/]	20,000	20,000	0	20,000	0	20,000	0	20,000	0	20,000	0
612	271,649	271,649	0	271,649	0	271,649	0	271,649	0	271,649	0
613	3,056,446	3,056,446	0	28,658,119[3/]	+838	28,658,119	+838	28,658,119	+838	28,658,119	+838
618	1,142,926	1,142,926	0	1,142,926	0	1,142,926	0	1,142,926	0	1,142,926	0
619	662,348	662,348	0	662,348	0	662,348	0	662,348	0	662,348	0
620	1,062,817	2,585,230[4/]	+143	2,585,230	+143	2,585,230	+143	2,585,230	+143	2,585,230	+143
621	5,014,508	5,014,508	0	5,014,508	0	5,014,508	0	5,014,508	0	5,014,508	0
622	17,321,780	17,321,780	0	17,321,780	0	17,321,780	0	17,321,780	0	17,321,780	0
624	5,748,299	6,722,587[5/]	+169	6,722,587	+169	6,722,587	+169	6,722,587	+169	6,722,587	+169
674	5,161,215	5,161,215	0	5,161,215	0	5,161,215	0	5,161,215	0	5,161,215	0
675	595,251	962,323[6/]	+62	962,323	+62	962,323	+62	962,323	+62	962,323	+62
Total	45,332,687	48,196,460	+6	73,798,133	+63	73,798,133	+63	73,798,133	+63	73,798,133	+63

SOURCE: TLMP 1990 Habitat Capability Model. Numbers also include smolt production in lakes.

1/ % = Percent difference between 1954 and indicated year.
2/ Values based on historical spawning survey data
3/ Installation of two fish passes in Old Franks drainage in 1992 increased predicted productivity. Increase based on data from Zadina and Haddix (1990) including lakes and streams in Old Franks system outside of Forest Service lands.
4/ Installation of the Dog Salmon River fish pass increased productivity.
5/ Installation of the Cable Creek fish pass increased productivity.
6/ Installation of the Sunny Creek fish pass increased productivity.

Table 4-16

Dolly Varden Char Habitat Capability and Percent Change from 1954 to 2145 by VCU

VCU	1954	1991	%[1/]	1995	%	2005	%	2115	%	2145	%
610	36,039	29,068	-19	28,041	-22	26,333	-27	23,666	-34	24,209	-33
611	6,552	6,552	0	6,552	0	6,552	0	6,552	0	6,552	0
612	23,190	23,190	0	23,190	0	23,190	0	23,190	0	23,190	0
613	149,328	149,328	0	149,328	0	149,328	0	149,328	0	149,328	0
618	43,407	42,801	-1	42,742	-2	42,571	-2	42,563	-2	42,613	-2
619	23,166	23,032	-1	23,011	-1	22,977	-1	22,926	-1	22,935	-1
620	54,623	53,934	-1	53,829	-1	53,559	-2	53,413	-2	53,494	-2
621	43,180	39,134	-9	38,488	-11	37,421	-13	35,354	-18	36,031	-17
622	103,986	92,509	-11	90,775	-13	88,001	-15	82,096	-21	84,164	-19
624	82,624	80,951	-2	80,568	-3	79,948	-3	78,472	-5	78,792	-5
674	68,914	68,914	0	68,914	0	68,914	0	68,914	0	68,914	0
675	19,103	19,103	0	19,103	0	19,103	0	19,103	0	19,103	0
Total	654,112	628,516	-4	624,541	-5	617,897	-6	605,577	-7	609,245	-7

SOURCE: TLMP 1990 Habitat Capability Model with 1993 modifications. Numbers also include production in lakes in each VCU.

1/ % = Percent difference between 1954 and indicated year.

The alternatives were not modeled individually using the habitat capability models. However, because of the small area of Class I and II streams that would have predicted changes in LWD for any alternative, no significant differences would be predicted among alternatives. LWD is a major component of stream habitat that can be affected by logging activity. Like sediment, LWD can have both positive and negative effects on streams, depending on the amount present. When trees are removed from riparian areas, particularly in Class I and II streams, it can have a direct adverse effect on fish habitat by reducing the input of LWD (see Chapter 3). It takes about 90 to 130 years after streamside tree removal in many Class I and II streams in the Tongass National Forest before stream input of LWD from second-growth forests exceeds loss of LWD from the original old-growth forest (TLMP Draft Revision 1991a).

Most of the adverse effects of changes in LWD supply, such as reduction in supply to Class I and II streams, or increased debris flows causing stream bed scour, would be mitigated by the application of prescribed buffers and BMP's (see Mitigation, this section). Minimum 100-foot buffers for Class I and important Class II streams would ensure gradual, long-term inputs of stable LWD, provided large areas of blowdown (windthrow) do not occur. At present, generally accepted and readily applicable rules for designing windfirm buffers adjacent to streams do not exist. The Ketchikan Area is currently monitoring stream buffer blowdown (Forest Service 1992j). One function of no-harvest buffers is to maintain the supply of LWD to the stream. Windthrow is the most common source of natural LWD loading (Gregory and Ashkenas undated). Consequently, the blowdown of portions of buffer strips merely changes the timing of debris inputs (Gregory and Ashkena undated). Catastrophic blowdown of long lengths of buffer on Class I streams could reduce long-term input of LWD. If catastrophic blowdown creates a detrimental condition, e.g., barriers to anadromous fish, modification of the debris accumulation should be considered on a case-by-case basis.

The dynamics of blowdown events are complex and still poorly understood. Blowdown may result in a short-term pulse of LWD to streams. This LWD would then decay and eventually wash out. Thereafter, a shortage of LWD might occur, lasting until regrowth of new trees within the previously buffered area is complete (more than 100 years). A more even flow of LWD to streams is preferable to pulsed inputs followed by decline.

LWD loss is a concern primarily for Class I and II streams (streams containing fish) and the amount of LWD lost is greatest where roads cross streams. The LWD is removed in a 75-foot-wide area where the road right-of-way is cleared to provide for culverts or bridges. Habitat loss would depend upon the amount of LWD present and removed. In addition, hazard trees likely to fall onto the road or stream crossing would be removed, further reducing the potential for LWD recruitment. Sources of LWD are also removed in Class II streams running directly to saltwater that do not require a 100-foot stream buffer.

The ranking of alternatives with regard to amount of LWD removed can be based upon the number of Class I and II stream crossings (see Table 4-11), and the extent of Class II unbuffered streams (Table 4-13).

Alternative 3 has the most removal of LWD in Class I and II streams, and the most removal of LWD overall. Alternatives F2 and F5 have the least removal of LWD in Class I streams. Alternative F5 has the lowest amount of LWD removal in Class II streams and in Class I and II streams combined. Alternatives F2 and 4 are intermediate in removal of LWD in Class II streams and in Class I and II streams combined. However, the relatively small amount of Class I and II streams in the Project Area with potential LWD removal (less than 1 percent of riparian management area in Class I and II streams) occurring indicates effects to fish habitat for any of the alternatives would be small.

Alternatives 3 and 4 propose road construction that parallels the stream channel in the Class I streams of Sunny and Cannery creeks, respectively. These routes do not encroach on the standard buffers for these streams, except at stream crossings, and would not adversely affect the aquatic resources in these streams.

Removal of vegetation on the upper banks of many Class III stream channels, and along the lower banks of unbuffered Class III streams, might result in mobilization of bedload materials through eventual sloughing of banks and movement of unstable LWD (including logging slash). The movement of these materials downstream, as well as possible increased streamflow in some heavily harvested drainages, might increase the probability of debris torrents. Debris torrents, primarily from high-gradient contained process group streams, might result in washout or destabilization of LWD in Class I and Class II streams farther downstream. Current guidelines for harvest adjacent to Class III channels are designed to limit the quantity of logging slash and unstable debris that enters these channels, thereby reducing the potential for destructive debris torrents. Although some risk remains, the results of these mitigation action will adequately protect fish resources in Class I and II streams.

Temperature and Dissolved Oxygen

The application of appropriate stream and lake buffers and other BMP's would maintain sufficient stream and lake canopy closure and avoid any potential for significant temperature increases.

Marked increases in summer temperature (e.g., greater than 60.8°F) or reduction in winter temperatures that cause anchor ice to form, can have adverse effects to fish in streams and lakes (see Chapter 3).

The potential effects of timber harvest and road construction on stream temperature are discussed under Water Quality above, and are probably minimal. Slight increases in summer stream temperatures and reduction in winter water temperature are possible; the net biological effects of any such increases or decreases are difficult to assess, but are probably small. Thus, no net gain or loss of salmonid production because of changes in stream temperature is expected in any of the alternatives. Significant decreases in dissolved oxygen because of increased stream or lake temperatures are also not expected.

Lakes in the Old Franks system (VCU 613) have been determined to be temperature- sensitive. Slight temperature increases to these lakes potentially may occur as a result of riparian canopy removal and increased solar warming of the numerous Class III streams that are tributary to Old Franks. Alternatives that include many units with southern or southeasterly aspect, as well as streams draining directly into the Old Franks system, have the most potential for thermal effects. Alternative 3 has the greatest potential for thermal increases to Old Franks system lakes (6 units fitting the above criteria), followed by Alternative 4 (4 units), Alternative F2 (3 units), and Alternative F5 (2 units). Although slight temperature increases are possible, these lakes are large, sufficiently deep, and well oxygenated in the deeper areas during warmer summer periods so that effects on resident or anadromous fish populations are unlikely (Zadina and Haddix 1990).

Miscellaneous Effects of Road Construction

Miscellaneous effects of road construction include potential effects on upstream fish passage and increased access to fisheries resources with a resulting increase in fishing pressure and exploitation rates.

Upstream fish passage, both for adult and juvenile salmon and trout, can be blocked when culverts are used to cross moderate- and high-gradient Class I or II streams. Proper implementation of BMP's for culvert installation will eliminate these potential impacts. Occasionally, culverts develop drops at the downstream ends that fish cannot ascend. Water velocity within the culvert might be too fast for fish to swim against. To reduce these risks, culverts must be of the proper size and type for the particular stream, and must be correctly oriented and installed.

Even though culverts will be selected, installed, and monitored regularly to maintain fish passage, there is still the possibility that they will be undercut by the stream and might fail to allow passage of fish at lower flows, or that they will become blocked or fail entirely at some point in their service life. The risk of reduced fish passage is roughly proportional to the number of culverts used. This risk is somewhat greater for Alternative 3 than for the other alternatives. The alternatives in descending order of number of culverts where fish passage would be of concern (Class I and II streams) are 3, 4, F2, and F5 with 22, 19, 18, and 14 culvert or bridge stream crossings, respectively. However Forest Service BMP's for road construction require that culvert installation supply adequate fish passage Class I and II streams. Implementation of BMP guidelines and proper monitoring (as described below) reduce risk so significant impacts to fish passage in the Project Area would not occur.

A potential indirect effect of new road construction on fish is to improve the roaded access to streams and lakes, resulting in the potential for increased subsistence harvest and recreational use of local fisheries resources. Mitigation action will reduce accessibility to some of the more important fisheries resources in the region (see *Mitigation* this section). All of the action alternatives would increase the roaded access to lakes to some extent. For example, all the alternatives would extend an existing road around Dog Salmon Lake to access Unit 620-209 (the unit is separated from the lake by a 100-foot, no-cut buffer and an additional 400-foot, selective-cut buffer). However, because Dog Salmon Creek is already easily accessible to recreational and subsistence users from the existing road, the new road segment would have little effect on lake accessibility. Both the creek and lake support anadromous sockeye salmon and cutthroat, both of which may be vulnerable to increased harvest.

Increased lake access might also increase fisheries harvest rates in the Old Franks Lake system. Species of concern again include resident cutthroat and sockeye (sockeye have recently been introduced there). Alternatives 3 and 4 would extend a road past Upper Old Franks Lake and into the lower Old Franks drainage beyond. Alternatives F2 and F5 would extend the road to within approximately 1/4 mile of the southwest corner of Upper Old Franks Lake, but not into the lower (northern part of) Old Franks drainage. Fishing and boating access to Upper Old Franks Lake would be encouraged in all the action alternatives by a portage trail leading from the road to the southeast corner of the lake. Motorized vehicle access beyond that point would be prevented in Alternatives 3 and 4 by closing the road after the timber harvest entry. However, during the entry, it would be difficult to restrict motorized vehicle access into the lower Old Franks drainage. Consequently Alternatives 3 and 4 have a higher potential to temporarily increase the roaded access to the lower Old Franks system, and a higher risk of increased harvest of local fisheries resources than Alternatives F2 or F5. But other than short periods during timber harvest, increased fishing effort in Old Franks system will be effectively reduced by the closure of roads.

Risk

Buffering of streams based on TTRA, TLMP Draft Revision, and applying BMP's (see *Mitigation* section for details) will greatly reduce impacts to fisheries resources for all alternatives. However, because of the difficulty of predicting the exact mitigation effectiveness and implementation of these actions, some risk to fisheries resources remains after these

actions are taken. Increased risk does not indicate impacts to the resource, as none of the alternatives are predicted to have significant adverse affects to fisheries resources because of the implementation of stream buffers, other TLMP guidelines, and Forest Service BMP's.

One way to evaluate the potential risk of impacts among the alternatives is to examine the buffers applied under these guidelines. Tables 4-9 and 4-10 show the total length of buffers by stream class applied to each action alternative. (Appendix C shows buffers by VCU).

In Figure 4-4, the values for the lengths of buffer and BMP treatments have been normalized (divided by the average value for all action alternatives) and weighted based upon the level of risk. The following weighting procedures were used:

The normalized lengths of one-sided buffers and one-sided BMP treatments were weighted by a factor of 1.

- The normalized lengths of two-sided stream buffers and two-sided BMP treatments were weighted by a factor of 2.

- The lengths of Class II resident fish streams receiving either no buffer, a partial buffer, or BMP's only were weighted by a factor of 3. Current standards and guidelines for stream protection, based on the TTRA, allow harvest to streambank of these Class II streams running directly to saltwater; consequently, the risk of effects to resident fish and their habitat is greater than for other types of stream treatments.

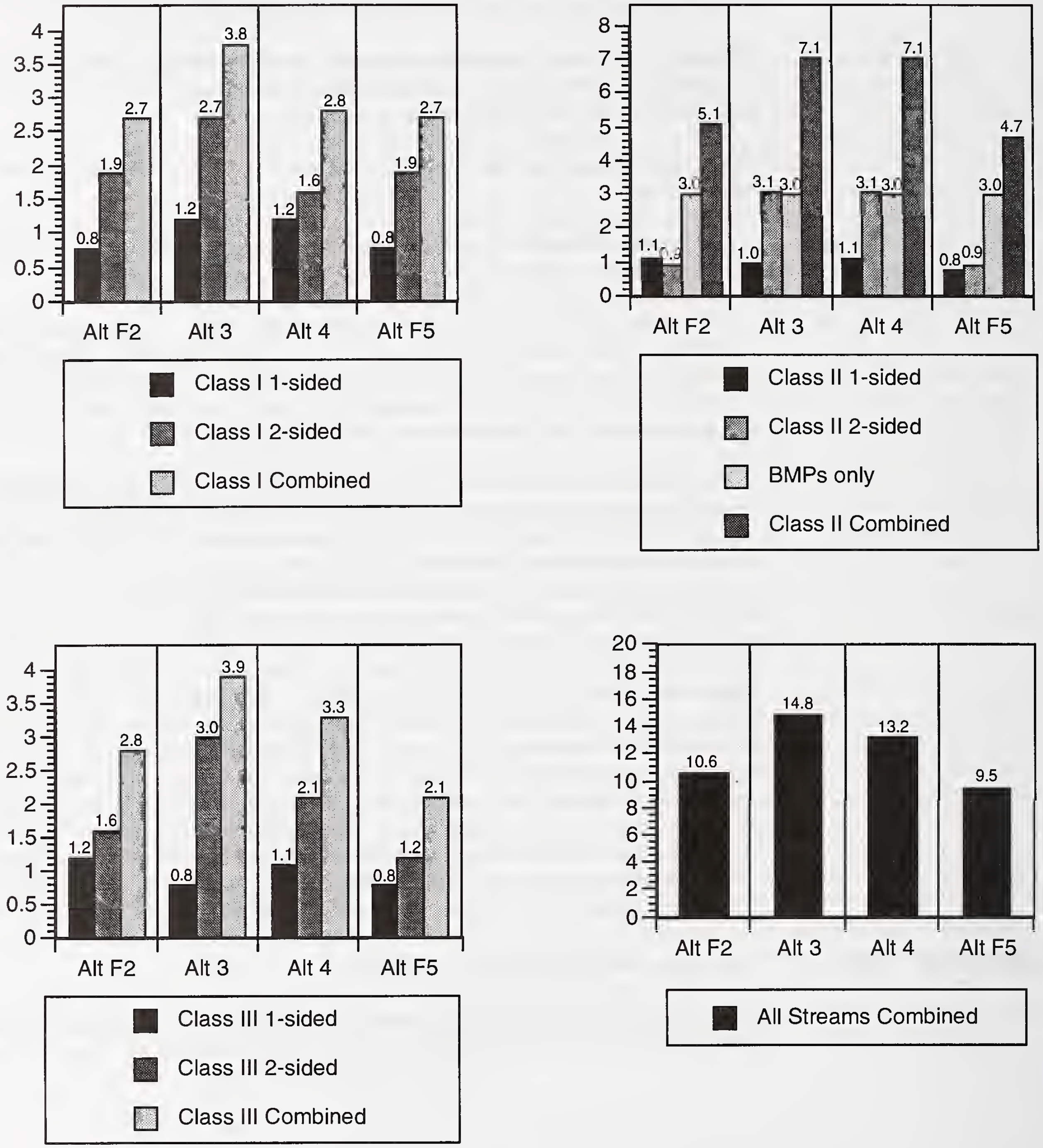
Normalizing and weighting the values in Appendix C allows each of the individual buffer strip and BMP-treatment categories to be combined. This facilitates comparison of the action alternatives in terms of their overall risk of effects to anadromous fish, resident fish, and downstream water quality. When comparing the alternatives, it is important to remember the alternative with the greatest length of buffered Class I and II streams also has the greatest potential risk of impacts to fish habitats. A reduced length of buffer means less logging will approach Class I or II streams, thus reducing the risk of channel and sediment effects. In general, potential blowdown is also proportional to the length of stream buffer; if more buffers are applied, the risk of buffers blowing down is increased. The same general rule applies to BMP's; the greater the length of stream treated with BMP's, such as split yarding of streams or full suspension of logs over channels, the greater the risk. Normalized values in Figure 4-4 retain this basic relationship: the higher the number, the greater the risk. Generally, Alternative 3 has the highest risk individually for Class I, II, and III streams, while other alternative's vary in ranking among stream classes (Figure 4-4). A combined ranking of alternatives, including risk of effects to anadromous fish streams, resident fish streams, and water quality shows that Alternative 3 has a higher risk than the other three alternatives. Alternative F5 has the least risk, and Alternative F2 rates slightly higher.

Cumulative Effects

Cumulative Watershed Effects Analysis

Cumulative watershed effects (CWE) standards and guidelines establish harvest thresholds within specified time periods to address the effects of timber harvest on streamflow increases

Figure 4-4
Relative (dimensionless) Risk of Potential Effects to Class I, Class II, Class III, and All Streams Combined Based on Quantity, Type, and Location of Stream Buffering



and sediment inputs. Two CWE thresholds exist and both apply to third order and larger watersheds. For the first CWE threshold, cumulative ground-disturbing activities are limited to 35 percent of the total watershed acreage over a 15-year period unless analysis indicates otherwise (TLMP Draft Revision 1991a). Table 4-17 shows the cumulative acreage harvested in the last 15 years by watershed by alternative for the Polk Inlet Project Area. Only one watershed would potentially exceed the threshold value. Originally, Beaver Creek (watershed FO9A) had approximately 11 percent harvest scheduled in this entry. Potentially harvestable Native ownership of this watershed, however, is 40 percent of the area. The Native-owned portion of the watershed is already being harvested and complete harvest is likely in the reasonably foreseeable future. Consequently, two units in this watershed were deferred from the unit pool in this entry to prevent potential stream discharge effects.

In the second CWE threshold, the percentage of riparian management area acreage harvested in channel types A1, A2, A4, A5, A6, A7, D2, and D7 in third order and larger watersheds is limited to 25 percent of the total riparian management area associated with these channel types over a 20-year period. During field verification, numerous previously unmapped streams were discovered in the harvest units. In some units, for example, as many as five unmapped A-type streams were found. Because of the large number of newly discovered streams, cumulative effects analysis would display a large affected acreage in the harvest units in comparison to the baseline of the GIS stream layer. Consequently, a procedure was utilized to increase the acreage of streams of the appropriate channel types in the GIS layer by an amount proportional to that found in the harvest units (Baker and Stewart 1993).

The procedure divided the riparian management area acreage in the harvest units after field verification by the riparian management area acreage in the harvest units in the original GIS layer. This gave a ratio of stream increase due to field verification of 2.5.

The original riparian acreage in each watershed was then increased by this correction factor to provide an estimate of the actual riparian acreage likely to exist on the ground. Twenty-five percent of this corrected total was then used as the threshold value for riparian acreage harvest in the watershed. The riparian acreage previously harvested was estimated in a similar manner by increasing the original GIS riparian acreage. Table 4-18 shows the threshold values and total riparian acreage harvested. In no case do the Polk Inlet Project units cause the threshold to be exceeded in any watershed.

Extensive previous harvest has occurred in the following watersheds: Maybeso Creek, Harris River, Cable Creek, Twelvemile Creek, and Cabin Creek. Except for Cabin Creek, this previous timber harvest occurred primarily in the 1960's and 1970's (Table 3-18). The maximum possible timber harvest units by watershed in this entry are as follows: Maybeso Creek (0), Harris River (5), Cable Creek (3), Twelvemile Creek (5), and Cabin Creek (4).

The Maybeso Creek watershed (VCU 610) was previously harvested primarily in the 1960's. There will be no harvest in this watershed in this entry.

The Harris River watershed (VCU 622) was previously harvested primarily in the 1960's. For the Harris River watershed, two of the five units will be helicopter yarded. The other three units are in the Fubar Creek drainage. These units are not included in Alternatives F2 and F5 but are in Alternatives 3 and 4.

The Cable Creek watershed (VCU 624) had considerable timber harvest in the 1960's and harvest has continued somewhat regularly up to the present (Table 3-18). If all units were harvested in this entry, the Cable Creek watershed would still only have seven percent harvest

in the last 15 years (Table 4-17). Additionally, one of the Cable Creek units is prescribed for helicopter yarding.

The Twelvemile Creek watershed (VCU 621) was previously harvested primarily in the 1960's. If all units were harvested in this entry the Twelvemile Creek watershed would still only have six percent harvest in the last 15 years (Table 4-17). One of these units, 621-201 had 100-foot extended-width buffers prescribed on the Class III stream to help maintain woody debris in the downstream Class I and II streams.

Cabin Creek is the only watershed with a high level of recent and proposed timber harvest. The lower watershed is privately-owned and has extensive harvest. The cumulative watershed effects analysis (Table 4-17) conservatively assumed that all forested land on private ownership would be harvested, although some of this is not likely commercial timber and some commercial timber may not be harvested in the near future. Even with this conservative estimate, the cumulative watershed harvest is still within standards and guidelines and negative effects due to increased streamflow are not expected. Additionally, one of the four units is prescribed for helicopter yarding. The road system to the other three units in this watershed will involve six Class III and no Class I or II stream crossings.

In all watersheds, BMP's within harvest units, for roads, and for stream crossings are designed to maintain water quality. Overall, water quality is expected to remain within the required water quality parameters in all the watersheds considered above.

Table 4-17

Cumulative Ground-Disturbing Activities by Major Watershed by Alternative in the Polk Inlet Project Area (by percent of total area)

Name	Watershed Number	Watershed Harvested 1980-95	Watershed Harvested 1980-1998				
			Alt. 1	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Pellet Creek	C75A	0	—	—	—	—	—
1/ ___	C80A	10	10	10	10	10	10
Maybeso Creek	C83C, C84B	0	—	—	—	—	—
Harris River	C85C, C86B	2	2	2	3	2	2
Cable Creek	D25C	5	5	6	7	7	6
Trocadero Creek	D26B	9	9	10	11	9	10
Twelvemile Creek	E67C	3	3	6	6	6	6
1/ ___	E68B	4	4	5	5	5	5
1/ ___	E79A	0	—	—	—	—	—
Old Tom Creek	E88A	0	—	—	—	—	—
Goose Bay Creek	E89A	16	16	18	16	18	18
Polk Creek	E93A	9	9	10	9	10	10
Rock Creek	E94A	6	6	9	6	7	7
Dog Salmon Creek 3/	E95B, E96C	12	12	13	13	13	12
Camp Creek	E97A	6	6	15	15	9	15
Cabin Creek 4/	F01A	29	29	33	29	34	32
Old Franks Creek 3/	F02A	5	5	9	11	8	8
Beaver Creek 5/	F09A	50	50	—	—	—	—
Sunny Creek	F25B, F26C	0	0	0	2	0	0
Cannery Creek	H21A	0	0	0	0	8	0
Big Creek	H23A	0	—	—	—	—	—
1/ ___	H26A	0	—	—	—	—	—
Indian Creek	2/ ___	6	6	11	15	10	6

SOURCE: Forest Service, Ketchikan Area, database.

1/ No name.
2/ No watershed number.
3/ Assumes all private land harvested.
4/ Assumes all private commercial forest land harvested.
5/ Assumes the privately owned 40 percent of this watershed will be harvested in the reasonably foreseeable future.

Table 4-18

Cumulative Harvest in Riparian Management Area for Channel Types A1, A2, A4, A5, A6, A7, D2, and D7 by Major Watershed and Alternative (in percent of total area)

Name	Watershed Number	Harvested 1974-1995	Harvested 1974-1998				
			Alt. 1	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Pellet Creek	C75A	0	—	—	—	—	—
1/___	C80A	25	25	—	—	—	—
Maybeso Creek	C83C, C84B	0	—	—	—	—	—
Harris River	C85C, C86B	13	14	14	14	14	14
Cable Creek	D25C	23	23	24	24	24	24
Trocadero Creek	D26B	3	3	3	3	3	3
Twelvemile Creek	E67C	5	5	7	7	7	7
1/___	E68B	10	10	10	10	10	10
1/___	E79A	2	2	—	—	—	—
Old Tom Creek	E88A	0	—	—	—	—	—
Goose Bay Creek	E89A	25	25	25	25	25	25
Polk Creek	E93A	18	18	18	18	18	18
Rock Creek	E94A	13	13	13	13	13	13
Dog Salmon Creek3/	E95B, E96C	9	9	10	10	10	10
Camp Creek	E97A	0	0	3	3	1	3
Cabin Creek4/	F01A	13	13	16	13	16	15
Old Franks Creek3/	F02A	7	7	8	10	8	8
Beaver Creek5/	F09A	49	49	—	—	—	—
Sunny Creek	F25B, F26C	0	0	<1	0	0	0
Cannery Creek	H21A	0	0	0	0	<1	0
Big Creek	H23A	0	—	—	—	—	—
1/___	H26A	0	—	—	—	—	—
Indian Creek	2/___	4	4	5	6	5	4

SOURCE: Forest Service, Ketchikan Area, database.

1/ No name.
2/ No watershed number.
3/ Assumes all private land harvested.
4/ Assumes all private commercial forest land harvested.
5/ Assumes the privately owned 40 percent of this watershed will be harvested in the reasonably foreseeable future.

Cumulative effects on fish resources were evaluated by examining the results of long-term predications of fish habitat capability models and other nonmodeled factors. Predictions of changes in fish habitat potential are presented for the MIS (Table 4-14, 4-15, and 4-16). Coho and pinksalmon over the long term show overall increase in potential from 1954 to 2145, averaging increases of 35 and 63 percent, respectively. The increase is a result of installation of fish passage facilities on several streams (see Chapter 3). pinksalmon habitat capability predictions remain unchanged after 1995, but the pinksalmon habitat capability model assumes no effects from any harvest activities. However, coho habitat capability in some VCU's continues to decrease beyond 1995. Long range predictions indicate that coho

potential in several of the watersheds in VCU's 610, 618, 621, and 622 (primarily Maybeso Creek, Old Toms Creek, Twelvemile Creek, and Harris River) continue to decrease in potential, resulting from logging activity that occurred prior to 1979. The continued reduction in potential is the result of loss of LWD in the streams because of substantial streamside harvest (see Chapter 3) of Class I streams in these watersheds between 1954 and 1979. The habitat potential begins to increase in these streams prior to 2145 (approximately 90 to 130 years after harvest) because of input of LWD to these streams from the development of riparian second-growth forests. Proposed actions taken under the Polk Inlet Project would not contribute to this predicted decline in projected habitat capability for coho salmon. Dolly Varden habitat capability decreases over time from 1954 to 2115, averaging a 9 percent decrease in the Project Area. The largest decrease occurs in Maybeso Creek, Twelvemile Creek, and Harris River. Again this is from older harvest, not from results of any of the considered alternatives. Based on these models, none of the alternatives will have cumulative adverse effects on fish resources.

Consideration of factors that cannot be included in the models suggests minor cumulative effects could occur to fisheries resources from the considered alternatives. In spite of TTRA buffers, extended width buffers, and implementation of BMP's, some increased risk of loss of stream habitat could occur. Factors such as unexpected logging-induced landslides, logging-enhanced blowdown, and impassible culvert installation could contribute to some minor adverse cumulative effects to the Project Area's fisheries resources. Because of the many mitigation measures (see Mitigation in this section) that will be implemented during harvest activity, these effects will be minor and not of significance. Also, the use of Knutson-Vandenburg (KV) funds, generated from logging sales receipts, to improve habitat and to open new areas for anadromous stocks by installation of fish passage may result in benefits above those predicted in the models.

Mitigation

Mitigation measures to reduce the magnitude of potential effects on water quality, streams, fish, and fisheries resources include planning, application of BMP's, application of appropriate stream buffer prescriptions, and road-access management prescriptions. These topics are discussed below. Appendix B and the unit and road cards identify which mitigation measures apply to each harvest unit and road segment.

Water Quality

Mitigation for protecting water quality occurs through both planning and the implementation of BMP's. These mitigation measures are documented in Chapter 10 of the Forest Service Soil and Water Conservation Handbook (FSH 2509.22) and are discussed in the Alaska Nonpoint Source Pollution Control Strategy. Mitigation of sediment inputs by roads to streams is accomplished through transportation planning, route location, contract preparation, and contract administration (Mitigation Measures F1 and F2). These procedures allow avoidance of hazardous areas during planning, the field documentation and avoidance of additional hazardous sites, the incorporation into the contract of site-specific recommendations, and contract administration to ensure compliance.

Other mitigation measures discussed in the FSH 2509.22 include those in the following discussion. Where surface-disturbed areas on roads are subject to erosion, they will be stabilized using techniques such as water barring, cross draining, outsloping, or other suitable means. To prevent water from running long distances over exposed ground, measures such as ditches, cross-drain spacing, and culverts will minimize soil erosion and sedimentation. The

seeding and fertilizing of cut slopes, fill slopes, and other disturbed areas will prevent soil erosion and sedimentation. Landings will be located and designed for erosion control; they will have proper drainage during use and shall be ditched or sloped to permit drainage and dispersion of water when abandoned. These procedures are broadly grouped as Mitigation Measure F8.

The above procedures have been found to be generally effective in mitigating sediment inputs to streams (MacDonald 1991). Stream buffer prescriptions and other BMP's related to streams are also applied and discussed below. Because these practices are relatively new, both implementation and effectiveness monitoring should be conducted (MacDonald 1991). Implementation and effectiveness monitoring procedures are discussed in Monitoring under this section.

Road construction at Sunny Creek and Cannery Creek in Alternatives 3 and 4, respectively, would cross the upper portion of small drainages that provide water supplies for homes at these sites. If either of these alternatives is implemented, the creeks that provide water supplies would be located and erosion control measures would be implemented with additional care during construction and maintenance to ensure that State Water Quality Standards for drinking water are met (Mitigation Measure F9).

Stream Buffer Prescriptions and BMP's

Buffers zones and BMP's along streams (Mitigation Measures F5, F6, and F7) are techniques implemented to reduce physical impacts to stream water quality and habitat. The extent of their application across the Project Area provides a general indication of mitigation of potential effects on streams.

Implementation of buffer prescriptions, as well as additional widening of buffers in the field, will largely mitigate potential impacts to streams. As shown in Appendix C, buffers applied at the planning stage are variable-width buffers (buffers greater or less than 100 feet wide). They are designed to be flexible and to provide the best level of protection to streams based on differences in channel type and stream class. Site-specific resource conditions, such as concern for windfirmness or adjacent hazard soils, resulted in some additional widening of buffers beyond planned buffer widths. Stream segments with extended-width buffers benefit from a higher level of protection than the TTRA requires. Directional felling and split yarding along Class III streams (Mitigation Measure F6) and buffers in steep V-notch streams with high erosion potential (Mitigation Measure F7) provide additional protection. Appendix C shows the actual extent of stream buffer and BMP application for all the action alternatives by VCU.

Stream buffers and BMP's have been found to be effective in mitigating stream temperature effects, sediment inputs, and loss of fish habitat (MacDonald 1991, EPA 1993) . In addition, long-term effectiveness monitoring is required by the Memorandum of Agreement (MOA) between the Alaska Department of Environmental Conservation (ADEC) and the Forest Service (Forest Service 1992d).

Lake Buffers and Guidelines for Thermal Sensitivity

Several Class I lakes in the Project Area, particularly in the Old Franks system, were identified as temperature-sensitive. Direct temperature increases to these and other large (greater than 50-acre) lakes are prevented by the use of extended buffers (Mitigation Measure F5). (These buffers typically include both a 100-foot no-harvest buffer and a 400-foot selective-cut buffer). Direct temperature increases to other smaller lakes (less than 50 acres) are avoided by the use of 100-foot buffers and other BMP's to maintain adequate canopy closure. The current

buffering system would ensure that significant temperature impacts would not occur to lakes in the Polk Inlet Project Area.

Road Construction Timing, Culverts, and Road Access Management

Road construction would adhere to the standard "timing windows" to avoid potential adverse effects of increased sediment inputs to streams during periods of salmonid egg/alevin incubation (Mitigation Measure F10). The timing of construction for the Ketchikan Administrative Area is shown in *Water, Fish, and Fisheries* in Chapter 3 and is designed to protect coho, pink, and chum salmon and steelhead trout spawning by reducing in-stream bridge and culvert activity at times when eggs may be in the gravel. Proper culvert selection and installation would minimize the risk of blocking fish passage; culverts would be monitored and maintained on a regular basis. During field sampling in 1992, several existing culverts in the Project Area were assessed to be at least partial barriers to upstream fish passage at lower flows. These are typically culverts on moderate- to high-gradient Class I or II streams. Culvert installation and design should follow standard Forest Service BMP's for culverts (Forest Service 1979b). For larger streams, bridges may be more suitable to insure fish passage.

Access to the Old Franks system would stop at the southernmost lake. Beyond this point access would be eliminated by blockage of the road to reduce adverse impacts to the fisheries from potentially high fisheries harvest rates. This access strategy would be implemented in Alternatives 3 and 4. Road access management decisions apply equally to all action alternatives and are described in detail in *Transportation and Facilities*.

Logging Debris Management

Logging debris generally is removed from streams. Split yarding and controlled felling practices would prevent large amounts of logging debris from entering streams during logging and road-building operations. Existing LWD in stream channels would be left in place. Opportunities for fish passage barrier removal identified during routine monitoring would be evaluated (Mitigation Measure F11).

Monitoring

The April 1992 MOA between the Alaska Department of Environmental Conservation and the Forest Service Alaska Region (Forest Service 1992d) is the basis for the maintenance of water quality and beneficial uses on the Project Area. BMP's are the primary means to mitigate sediment and other water quality effects to the water resource. BMP's are evaluated by implementation monitoring and effectiveness monitoring. BMP's are recognized as effective in maintaining water quality (ADEC 1990, EPA 1993). The forest-wide monitoring plan described in the TLMP Draft Revision (1991a) lists two monitoring activities specifically aimed at BMP's. One is directed at BMP implementation (Watershed Monitoring Item 1) and the other is directed at BMP effectiveness (Watershed Monitoring Item 2). Additional monitoring of BMP's is included under fish and watershed monitoring activities. The Ketchikan Area Office and ADEC are currently coordinating to identify the specific procedures and protocols for documenting implementation monitoring and effectiveness monitoring on the Ketchikan Area. The following provides general procedures for BMP monitoring and associated water quality maintenance.

Since BMP's have been designed and are presumed to meet State Water Quality Standards, they must be implemented as required and as instructed in the Alaska Nonpoint Source Pollution Control Strategy (ADEC 1990) and Chapter 10 of the Forest Service Soil and Water

Conservation Handbook. The timber sale contract administrator, as the person with day-to-day project contact, will be primarily responsible for ensuring the implementation of BMP's. The contract administrator will be supported by Forest Service Area Office and District Office resource specialists who will document BMP implementation when observed during field investigations. If resource specialists observe situations where BMP's are not being implemented, they will report their findings to the contract administrator for immediate action.

Effectiveness monitoring includes both routine field observations and comprehensive monitoring projects. Routine effectiveness monitoring includes visual observations and documentation. Again, the timber sale contract administrator, as the person with day-to-day project contact, is primarily responsible for routine effectiveness monitoring. The visual observations include road runoff, proper culvert and bridge placement procedures, water turbidity at culverts and bridges, and revegetation. The contract administrator will document such observations and include them in the contract administration reports. Resource specialists from the Area Office and District Office will also make visual observations when they are in the Project Area and will provide written documentation to the timber sale administrator.

Comprehensive effectiveness monitoring includes, but is not limited to, evaluations that provide quantitative documentation. Comprehensive monitoring plans are currently being developed and discussed with ADEC. These comprehensive monitoring activities will follow procedures in the Alaska Nonpoint Source Pollution Control Strategy ADEC (1990) and the Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska (MacDonald 1991).

Baseline monitoring, which describes the range and trends in temporal and spatial water quality variations, is a type of monitoring activity that is considered optional under the MOA (Forest Service 1992d). Considerable baseline water quality data exists for the Polk Inlet Project Area. A selection of this water quality data is provided in Baker and Stewart (1993) and the complete data set is on file at the Ketchikan Area Office.

Additional forest-wide monitoring described in the TLMP Draft Revision (1991a) includes: implementation and effectiveness monitoring for fish and riparian standards and guidelines (Fish Habitat Monitoring Items 1 and 2), effectiveness monitoring for fish enhancement projects (Fish Habitat Monitoring Item 3), validation monitoring for fish habitat models (Fish Habitat Monitoring Item 4), and effectiveness and validation monitoring for cumulative watershed effects threshold (Watershed Monitoring Item 4).

The Polk Inlet Project Area provides an opportunity for long-term monitoring of aquatic habitat and its relationship to the riparian ecosystem. Early studies and documentation of conditions in the Maybeso Experimental Forest, the Harris River, Twelvemile Creek, and the Old Tom Research Natural Area were presented in James (1956) and Meehan et al. (1969). Subsequently, Bryant (1980, 1989) studied LWD in many of these rivers. Consequently, there is a longer record of conditions here than in most areas of the Tongass National Forest. This historical record provides a unique opportunity to document and evaluate the effects of past and present management activities in the region.

Vegetation and Timber Resources

Key Terms

Commercial forest land (CFL)—land that is capable of producing continuous crops of timber (20 cubic feet of tree growth annually, or at least 8 MBF).
Even-aged—management techniques that result in the creation of stands in which trees of essentially the same age grow together.
MBF—thousand board feet.
MMBF—million board feet.
Overstory—the portion of trees in a forest that forms the uppermost layer of foliage; also called the canopy.
Partial cut—method of harvesting trees where any number of live trees are left standing in any of various spatial patterns; not clearcutting.
Regeneration—the process of establishing a new crop of trees on previously harvested land.
Reserved—lands that have been withdrawn from the timber base by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.
Uneven-aged—management techniques that result in the creation of stands that exhibit a range of diameter or age classes.
Windfirm—individual trees that are able to resist windthrow or the configuration of harvest units so as not to create an opening which exposes the adjacent stand of timber to the direction of the major prevailing storm wind (southeast).
Windthrow—the act of trees being uprooted by the wind.

Introduction

This section summarizes the potential effects to the timber and vegetation resources in the Polk Inlet Project Area from implementation of the action alternatives. It is divided into five parts: Direct Effects, Indirect Effects, Cumulative Effects, Mitigation Measures, and Monitoring.

Direct Effects

Timber harvest activities on the Tongass National Forest are strictly governed by standards and guidelines designed to minimize detrimental effects to other resources. These standards and guidelines can be found in TLMP Draft Revision (1991a) and the Forest Service Soil and Water Conservation Handbook (Forest Service 1991c).

Proposed Harvest Units

The individual units proposed for harvest under each alternative are displayed in the alternative maps at the end of Chapter 2. The logging system, number of acres, net and utility volume to be harvested, and volume per acre are itemized by harvest unit in Appendix B. The number of units proposed, the number of acres in harvest units, and the average unit size are summarized by alternative in Table 4-19.

Table 4-19

Number of Units, Acres, and Average Unit Size by Alternative

Alternative	Number of Units	Total Harvest Unit Acres	Average Unit Size (acres)
1	0	0	0
F2	88	3,951	44.9
3	113	4,711	41.7
4	87	3,913	45.0
F5	71	3,306	46.6

The National Forest Management Act of 1976 (NFMA) limits the size of a forest opening that may be created based on the forest type. For coastal Alaska, (Forest Service 1983) the maximum opening size for the western hemlock/Sitka spruce forest type is 100 acres. Under NFMA, the opening size may be extended to 150 acres under certain conditions and 200 acres under extreme circumstances (major insect and disease outbreak, fire, windthrow, or other form of catastrophic damage).

NFMA and the Alaska Regional Guide provide exception for the following reasons:

1. Topography
2. Spatial relationship of unit to other natural or artificial opening and proximity of units
3. Coordination and consistency with adjacent management areas
4. Effect on water quality and quantity
5. Visual absorption capacity
6. Effect on wildlife and fish habitat
7. Regeneration requirements for desirable tree species, based on latest research
8. Transportation and harvesting system requirements
9. Natural and biological hazards to the survival of residual trees and surrounding stands
10. Relative total costs of preparation, logging, and administration of harvest cuts

Each of the action alternatives proposes harvest units that exceed 100 acres, but are less than 150 acres. Harvest units that exceed the size limits and meet the criteria in each case are 613-107 (133 acres), 613-245 (101 acres), 620-291 (111 acres), 621-237 (102 acres), and 624-242 (109 acres). Units 613-245 and 624-242 are partial cut units. The specific reasons for exceeding 100 acres are reasons 1, 8, and 10 as listed above. Table 4-20 summarizes the number of units proposed that exceed 100 acres along with the range of unit sizes by alternative. Calculations of harvest unit acreage considered adjacent units as well as combinations of proposed harvest units adjacent to units that were proposed to be harvested under the 1989-94 EIS whose cumulative total was over 100 acres.

Table 4-20
Number of Harvest Units Exceeding 100 Acres and Range of Unit Sizes by Alternative

Alternative	Total Number of Units	Number Exceeding 100 Acres	Range of Sizes for Units Exceeding 100 Acres[1/]
1	0	0	0
F2	88	4	102 to 133
3	113	4	101 to 133
4	87	3	102 to 133
F5	71	4	102 to 133

1/ Units exceeding 100 acres in size include: 613-107 (133 ac), 613-245 (101 ac) (partial cut), 620-291 (111 ac), and 621-237 (102 ac), and 624-242 (109 ac) (partial cut).

Past Harvest, Proposed Harvest, and Total Harvest Acreage

Acreage of past harvests, including the full implementation of the 1989-94 EIS, acreage of proposed harvest for the Polk Inlet Project, and the total acreage of harvest including the Polk Inlet Project is displayed in Tables 4-21 through 4-24 for each action alternative. The tables also show the percent of suitable/available, percent of commercial forest land (CFL), and percent of total land area for the total area harvested.

Under all alternatives, 15 percent of the total land area would be harvested following full implementation of the Polk Inlet Project. This total harvest would represent 28 to 29 percent of the CFL as well as 28 to 30 percent of the suitable/available CFL.

Proposed Harvest by Major Plant Series

Timber harvest activities would affect forested plant communities, but would have little effect on nonforest plant communities. The only exception would be road segments that may cross nonforested areas. Timber harvest activities convert climax forest stands into young, vigorous successional stands.

Removal of the forest overstory alters the microsite conditions that influence species composition and density of the understory vegetation. Species that thrive best in the shaded and protected environment of a mature forest, such as some mosses, lichens, forbs, and shrubs, would not have this beneficial influence following harvest. Such species would likely be reduced in vigor and competitive ability. Species such as huckleberry, salmonberry, and western hemlock survive as understory species, but become vigorous competitors for space when released. Other species such as Sitka spruce do not reproduce or survive well in the understory, but are able to develop rapidly from seed in open conditions.

Table 4-21

Acreage of Past Harvest, Proposed Harvest for Alternative F2, Total Harvest, and Percent Harvested (not including encumbered lands)

	Alternative F2			Total Harvest		
VCU	Past Harvest 1/	Proposed Harvest	Total Harvest	% of Suitable/Available	% of CFL	% of Land Area
610	2,831	0	2,831	23	42	26
611	333	0	333	10	12	6
612	15	292	307	18	18	6
613	875	853	1,728	36	23	9
618	934	0	934	14	9	5
619	1,140	300	1,440	29	26	17
620	3,482	1,029	4,511	34	32	19
621	5,402	637	6,039	46	45	26
622	2,610	391	3,001	34	34	17
624	3,538	425	3,963	52	51	28
674	113	24	137	1	1	1
675	0	0	0	0	0	0
Total	21,273	3,951	25,224	29	27	15

SOURCE: Forest Service, Ketchikan Area, database.

1/ After full implementation of the 1989-94 EIS.

2/ + represents <0.5.

Forest floor vegetation

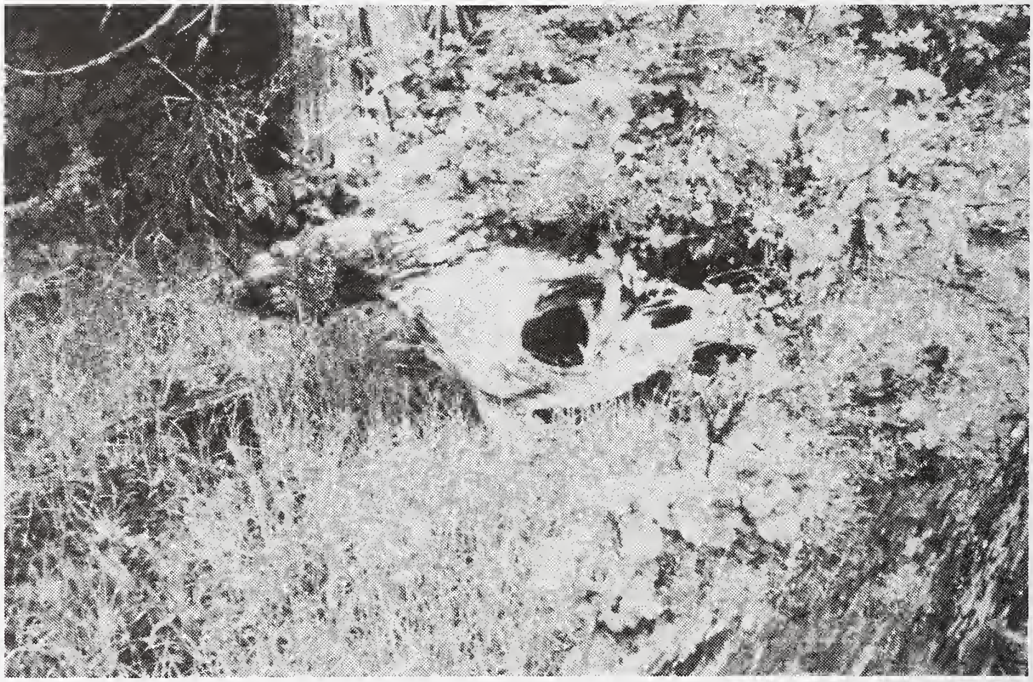


Table 4-22

Acreage of Past Harvest, Proposed Harvest for Alternative 3, Total Harvest, and Percent Harvested (not including encumbered lands)

	Alternative 3			Total Harvest		
VCU	Past Harvest 1/	Proposed Harvest	Total Harvest	% of Suitable/Available	% of CFL	% of Land Area
610	2,831	0	2,831	23	42	26
611	333	130	463	16	16	8
612	15	186	201	12	12	4
613	875	1,180	2,055	41	27	11
618	934	0	934	14	9	5
619	1,140	22	1,162	24	21	14
620	3,482	589	4,071	30	29	17
621	5,402	1,271	6,673	50	50	29
622	2,610	627	3,237	33	37	19
624	3,538	514	4,052	51	53	28
674	113	0	113	+ 2/	1	1
675	0	192	192	8	7	3
Total	21,273	4,711	25,984	30	29	15

SOURCE: Forest Service, Ketchikan Area, database.

1/ After full implementation of the 1989-94 EIS.

2/ + represents <0.5.

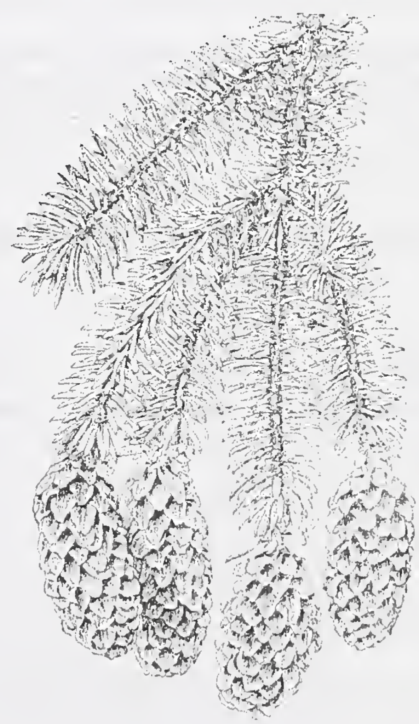


Table 4-23

Acreage of Past Harvest, Proposed Harvest for Alternative 4, Total Harvest, and Percent Harvested (not including encumbered lands)

	Alternative 4			Total Harvest		
VCU	Past Harvest 1/	Proposed Harvest	Total Harvest	% of Suitable/Available	% of CFL	% of Land Area
610	2,831	0	2,831	23	42	26
611	333	0	333	10	12	6
612	15	461	476	29	28	9
613	876	663	1,539	34	21	8
618	934	164	1,098	17	11	6
619	1,140	267	1,407	28	25	17
620	3,482	731	4,213	32	30	18
621	5,402	907	6,309	47	48	27
622	2,610	284	2,894	29	33	17
624	3,538	274	3,812	48	50	27
674	113	162	275	2	3	2
675	0	0	0	0	0	0
Total	21,273	3,913	25,186	29	28	15

SOURCE: Forest Service, Ketchikan Area, database.

1/ After full implementation of the 1989-94 EIS.

Table 4-24

Acreage of Past Harvest, Proposed Harvest for Alternative F5, Total Harvest, and Percent Harvested (not including encumbered lands)

	Alternative F5			Total Harvest		
VCU	Past Harvest [1/]	Proposed Harvest	Total Harvest	% of Suitable/Available	% of CFL	% of Land Area
610	2,831	0	2,831	23	42	26
611	333	0	333	10	12	6
612	15	292	307	18	18	6
613	875	779	1,654	35	22	9
618	934	0	934	14	9	5
619	1,140	192	1,332	27	24	16
620	3,482	889	4,371	33	31	19
621	5,402	579	5,981	45	45	26
622	2,610	156	2,766	28	32	16
624	3,538	419	3,957	50	52	28
674	113	0	113	+ [2/]	1	1
675	0	0	0	0	0	0
Total	21,273	3,306	24,579	28	27	15

SOURCE: Forest Service, Ketchikan Area, database.

1/ After full implementation of the 1989-94 EIS.

2/ + represents <0.5.

Table 4-25 displays the major plant series by alternative using the percent of sample plots in each plant series as recorded during stand examination field work. Western hemlock would be the most widely harvested series; shore pine followed by Sitka spruce would be the least.

Table 4-25

Percent of Harvest Unit Stand Exam Plots Established in each Major Plant Series by Alternative

Alt.	Western Hemlock	Western Hemlock/ Redcedar	Western Hemlock Yellowcedar	Sitka Spruce	Mt. Hemlock	Mountain Hemlock Yellow-cedar	Shore Pine	Mixed Conifer
F2	25.6	18.1	11.7	2.3	16.2	9.4	1.7	14.9
3	22.5	19.0	12.4	2.1	18.3	8.2	1.7	15.7
4	26.8	24.9	13.3	1.9	9.7	5.8	1.4	16.2
F5	27.8	17.0	12.2	2.5	16.6	8.0	1.8	14.0

SOURCE: Polk Inlet Stand Examination Cards.

Proposed Harvest by Volume Class

The acreage harvested by volume class and percent of the existing volume class acreage is displayed by VCU for each alternative in Tables 4-26 through 4-29.

The acreage in the "other" category consists of areas mapped as noncommercial forest or Volume Class 3. These areas represent either inclusions within or along the edges of harvest units or areas that should be upgraded to Volume Class 4 or higher based on field verification. Alternative 3 would harvest the greatest acreage of Volume Classes 4 and 5. Alternative 4 would harvest the greatest acreage of Volume Classes 6 and 7.

Proportionality of Volume Class 6 and 7 Proposed for Harvest

The effects of timber harvest activities on proportionality in MA's K17 and K18 are shown by alternative in Table 4-30. Under Alternative 1a, the proportionality in MA K17 would be approximately equal to the TTRA baseline, and the MA K18 proportionality would be approximately 1 percent less. Under Alternative 1, proportionality would decrease in MA K17 and increase in MA K18, but both would be below the TTRA baseline.

The action alternatives would each increase proportionality in both MA's. In MA K17, proportionality would range from 0.34 to 0.53 percent lower than the TTRA baseline with Alternative 3 ranking the lowest. In MA K18, proportionality would range from 0.07 percent lower to 0.53 percent lower than the TTRA baseline with Alternative 4 ranking the lowest.

Table 4-26

Acreage Harvested for Alternative F2 by Volume Class and VCU and Percent Harvested of Existing Acreage in Each Volume Class and VCU[1/]

VCU	Volume Class 4		Volume Class 5		Volume Class 6	
	Harvested	% of Existing	Harvested	% of Existing	Harvested	% of Existing
610	0	0	0	0	0	0
611	0	0	0	0	0	0
612	134	14	80	14	45	26
613	421	12	125	10	104	10
618	0	0	0	0	0	0
619	137	7	66	9	65	14
620	410	9	311	13	104	5
621	272	7	211	7	41	4
622	153	6	124	4	51	7
624	161	7	199	9	0	0
674	3	+	0	0	20	1
675	0	0	0	0	0	0
Total Proposed Harvest	1,691	6	1,116	5	430	4

VCU	Volume Class 7		Other[2/]		Total	
	Harvested	% of Existing	Harvested	% of Existing	Harvested	% of Existing
610	0	0	0	0	0	0
611	0	0	0	0	0	0
612	5	42	28	1	292	5
613	83	21	120	1	853	5
618	0	0	0	0	0	0
619	0	0	32	1	300	3
620	61	5	143	1	1,029	4
621	0	0	113	1	637	3
622	0	0	63	1	391	2
624	0	0	65	1	425	3
674	0	0	1	+	24	+
675	0	0	0	0	0	0
Total Proposed Harvest	149	2	565	1	3,951	2

1/ % of Existing = % harvested of the existing acreage in each volume class and VCU as of late 1994 after full implementation of the 1989-94 EIS.

2/ Includes areas mapped as noncommercial forest and Volume Class 3. These areas represent either inclusions within or along the edges of harvest units or areas that should be upgraded to Volume Class 4 or higher based on ground verification.

3/ + = less than 0.5%.

Table 4-27

Acreage Harvested for Alternative 3 by Volume Class and VCU and Percent Harvested of Existing Acreage in Each Volume Class and VCU[1/]

VCU	Volume Class 4		Volume Class 5		Volume Class 6	
	Harvested	% of Existing	Harvested	% of Existing	Harvested	% of Existing
610	0	0	0	0	0	0
611	47	4	71	6	3	1
612	124	13	50	9	1	1
613	510	15	236	20	216	20
618	0	0	0	0	0	0
619	17	1	0	0	0	0
620	278	6	121	5	52	3
621	586	16	336	12	135	13
622	301	13	154	5	52	9
624	211	10	203	9	4	2
674	0	0	0	0	0	0
675	28	3	53	5	21	6
Total Proposed Harvest	2,102	7	1,224	6	496	5

VCU	Volume Class 7		Other[2/]		Total	
	Harvested	% of Existing	Harvested	% of Existing	Harvested	% of Existing
610	0	0	0	0	0	0
611	0	0	9	+[3/]	130	2
612	0	0	11	+	186	3
613	83	21	135	2	1,180	6
618	0	0	0	0	0	0
619	0	0	5	+	22	3
620	26	2	112	1	589	3
621	17	9	197	1	1,271	6
622	0	0	108	1	627	4
624	0	0	96	1	514	3
674	0	0	0	0	0	0
675	68	12	22	1	192	3
Total Proposed Harvest	194	3	695	1	4,711	3

1/ % of Existing = % harvested of the existing acreage in each volume class and VCU as of late 1994 after full implementation of the 1989-94 EIS.

2/ Includes areas mapped as noncommercial forest and Volume Class 3. These areas represent either inclusions within or along the edges of harvest units or areas that should be upgraded to Volume Class 4 or higher based on ground verification.

3/ + = less than 0.5%.

Table 4-28

Acreage Harvested for Alternative 4 by Volume Class and VCU and Percent Harvested of Existing Acreage in Each Volume Class and VCU[1/]

VCU	Volume Class 4 Harvested	Volume Class 4 % of Existing	Volume Class 5 Harvested	Volume Class 5 % of Existing	Volume Class 6 Harvested	Volume Class 6 % of Existing
610	0	0	0	0	0	0
611	0	0	0	0	0	0
612	245	25	130	24	46	26
613	362	11	58	5	103	10
618	12	+[3/]	18	1	85	6
619	106	5	66	9	65	14
620	310	7	206	9	104	5
621	447	12	289	11	41	4
622	152	6	51	2	26	4
624	87	4	149	7	4	2
674	21	1	4	+[3/]	55	3
675	0	0	0	0	0	0
Total Proposed Harvest	1,742	6	971	5	529	5

VCU	Volume Class 7 Harvested	Volume Class 7 % of Existing	Other[2/] Harvested	Other[2/] % of Existing	Total Harvested	Total % of Existing
610	0	0	0	0	0	0
611	0	0	0	0	0	0
612	5	42	35	1	461	9
613	83	21	57	1	663	4
618	43	3	6	+[3/]	164	1
619	0	0	30	1	267	3
620	61	5	50	1	731	3
621	0	0	130	1	907	4
622	0	0	55	+[3/]	284	2
624	0	0	34	+[3/]	274	2
674	78	4	4	+[3/]	162	1
675	0	0	0	0	0	0
Total Proposed Harvest	270	4	401	1	3,913	2

1/ % of Existing = % harvested of the existing acreage in each volume class and VCU as of late 1994 after full implementation of the 1989-94 EIS.

2/ Includes areas mapped as noncommercial forest and Volume Class 3. These areas represent either inclusions within or along the edges of harvest units or areas that should be upgraded to Volume Class 4 or higher based on ground verification.

3/ + = less than 0.5%.

Table 4-29

Acreage Harvested for Alternative F5 by Volume Class and VCU and Percent Harvested of Existing Acreage in Each Volume Class and VCU[1/]

VCU	Volume Class 4		Volume Class 5		Volume Class 6	
	Harvested	% of Existing	Harvested	% of Existing	Harvested	% of Existing
610	0	0	0	0	0	0
611	0	0	0	0	0	0
612	134	14	80	14	45	26
613	369	11	123	10	104	10
618	0	0	0	0	0	0
619	73	4	67	9	26	6
620	362	8	294	13	68	3
621	258	7	203	7	18	2
622	65	3	46	2	26	4
624	161	8	199	9	0	0
674	0	0	0	0	0	0
675	0	0	0	0	0	0
Total Proposed Harvest	1,422	5	1,012	5	287	3

VCU	Volume Class 7		Other[2/]		Total	
	Harvested	% of Existing	Harvested	% of Existing	Harvested	% of Existing
610	0	0	0	0	0	0
611	0	0	0	0	0	0
612	5	42	28	1	292	5
613	83	21	100	1	779	4
618	0	0	0	+[3/]	0	0
619	0	0	26	1	192	2
620	48	4	117	1	889	4
621	0	0	100	1	579	2
622	0	0	19	+[3]	156	1
624	0	0	59	1	419	3
674	0	0	0	0	0	0
675	0	0	0	0	0	0
Total Proposed Harvest	136	2	449	1	3,306	2

1/ % of Existing = % harvested of the existing acreage in each volume class and VCU as of late 1994 after full implementation of the 1989-94 EIS.

2/ Includes areas mapped as noncommercial forest and Volume Class 3. These areas represent either inclusions within or along the edges of harvest units or areas that should be upgraded to Volume Class 4 or higher based on ground verification.

3/ + = less than 0.5%.

Table 4-30
Proportion of Volume Classes 6 and 7 Proposed for Harvest by Management Area[1]

	Total Timber Base (acres)	Volume Class 6 & 7 (acres)	Proportionality[2] (percent)	Difference[3] (percent)
Management Area K17				
TTRA Baseline				
(on November 28, 1990)	29,518	3,584	12.14	
Alternative 1a				
- Harvested Prior to ROD	-76	0		
- Remaining in K17	29,442	3,584	12.17	+0.03
Alternative 1				
- Scheduled for Harvest After ROD	-1,390	-351		
- Remaining in K17	28,052	3,233	11.53	-0.61
Alternative F2				
- Proposed for Harvest	-1,212	-92		
- Remaining in K17	26,840	3,141	11.70	-0.44
Alternative 3				
- Proposed for Harvest	-2,132	-223		
- Remaining in K17	25,920	3,010	11.61	-0.53
Alternative 4				
- Proposed for Harvest	-1,246	-71		
- Remaining in K17	26,806	3,162	11.80	-0.34
Alternative F5				
- Proposed for Harvest	-976	-44		
- Remaining in K17	27,076	3,189	11.78	-0.36
Management Area K18				
TTRA Baseline				
(on November 28, 1990)	50,751	19,489	38.40	
Alternative 1a				
- Harvested Prior to ROD	-3,151	-1,680		
- Remaining in K18	47,600	17,809	37.41	-0.99
Alternative 1				
- Scheduled for Harvest After ROD	-907	-258		
- Remaining in K18	46,693	17,551	37.59	-0.81
Alternative F2				
- Proposed for Harvest	-2,174	-487		
- Remaining in K18	44,519	17,064	38.33	-0.07
Alternative 3				
- Proposed for Harvest	-1,884	-467		
- Remaining in K18	44,809	17,084	38.13	-0.27
Alternative 4				
- Proposed for Harvest	-2,266	-728		
- Remaining in K18	44,427	16,823	37.87	-0.53
Alternative F5				
- Proposed for Harvest	-1,881	-379		
- Remaining in K18	44,812	17,172	38.32	-0.08

1/ Includes lands encumbered after TTRA so that comparisons can be made with TTRA baseline.

2/ Proportionality = Acres of Volume Classes 6 and 7 divided by the Total Timber Base.

3/ A positive difference indicates that the percent of Volume Classes 6 and 7 remaining in the MA is higher than the TTRA baseline. A negative difference indicates a lower percentage than the TTRA baseline.

Acres Harvested by Site Index

Site index is a measure of the relative productivity of a particular forest site. Knowledge of the productivity is important in predicting future yields and to assist the forest manager in establishing silvicultural priorities.

Although the soils-based rating of site class was adequate for the TLMP, it is not site specific. To develop a site-specific index for the Polk Inlet Project, plant associations were identified for each stand examination plot established. Using these plant associations and the Forest Plant Association Management Guide (DeMeo 1989), a site-specific measure of productivity was determined. This measure of productivity was then compared to the site index data from the GIS soils database to locate and resolve any discrepancies and provide a field verified measure of site index. Table 4-31 displays the acres of proposed harvest by site index for each alternative.

Table 4-31

Acres of Proposed Harvest by Site Index for Each Action Alternative

Site Index	Alt. F2	Alt. 3	Alt. 4	Alt. F5
<51	866	1,468	910	650
51-60	154	193	16	125
61-70	452	543	310	409
71-80	956	417	982	934
81-90	633	885	676	450
>90	890	1,205	1,019	738
Total	3,951	4,711	3,913	3,306

In general, more timber can be grown in a given time period on highly productive sites than on sites of lower productivity. When harvesting in an old-growth, climax forest, it is more economically feasible to harvest the sites with the highest productivity rating. By replacing the old-growth forest on the highly productive sites first with young, vigorous trees, the forest as a whole will produce more timber. However, there are also other factors to consider when establishing harvesting priorities. Generally a timber sale is comprised of harvest units across the range of productivity.

Proposed Harvest by Logging System

The logging systems proposed for each alternative are identified in Table 4-32. Highlead is the most common system proposed, followed by running skyline and helicopter.

Proposed Harvest by Silvicultural System

Both even and uneven-aged systems are proposed for use in the Polk Inlet Project. Clearcutting is proposed as the optimum system for most units based on the rationale presented in *Vegetation and Timber Resources* in Chapter 3. However, ecosystem management opportunities were identified for all harvest units by incorporating the use of reserve trees in the clearcutting prescription or by prescribing different silvicultural systems.

Table 4-32
Harvest Unit Acres by Logging System

	Logging System							
Alt.	Highlead	Running Skyline	Slackline	Live Slackline	Standing Skyline	Shovel	Helicopter	Total
1	0	0	0	0	0	0	0	0
F2	1,633	1,048	133	0	0	28	1,108	3,951
3	1,815	836	162	38	55	28	1,777	4,711
4	2,085	1.092	162	20	55	28	471	3,913
F5	1,430	913	133	0	0	28	803	3,306

Clearcutting with reserve trees was prescribed for all harvest units to maintain snags and higher structural diversity in the regenerated stand and to lessen visual contrast. This method requires care during the harvesting process to protect the reserve trees from disturbance. Cable logging systems using three-drum yarders and carriages with skidding lines or helicopter logging systems allow for the greatest versatility in leaving residual trees and snags. The Reserve Tree Selection Guidelines (Forest Service 1993a) were used to prescribe marking guidelines for reserve tree selection.

All four types of clearcutting with reserve trees have been prescribed (see *Vegetation and Timber Resources* in Chapter 3 and Figure 3-5). These are identified as Mitigation Measures W1, W3, W4, and W5 for wildlife resources (see *Wildlife*, this chapter) and Mitigation Measures V2, V3, and V4 for visual resources (see *Visual Resources*, this chapter).
Uneven-aged systems, primarily diameter cuts, are proposed as appropriate systems for a number of units. These partial cuts are mostly planned for helicopter yarding in areas with high visual sensitivity, where it is desirable to maintain high structural diversity for wildlife in the post-harvest stand, and areas where it is desirable to maintain yellowcedar in the regenerated stand without hand planting. Partial cuts are identified as Mitigation Measures T1, W2 and V2 for timber, wildlife, and visual resources.

The number of units and acres proposed for clearcutting (including all four types) and partial cutting under each action alternative are listed in Table 4-33. Specific units are identified relative to their silvicultural system in the site-specific mitigation measures table of Appendix B.

Clearcut

Table 4-33
Harvest Unit Acres by Silvicultural System

Silvicultural System	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Clearcut				
Type A	1,565	1,820	1,922	1,314
Type B	668	629	798	641
Type C	722	930	368	518
Type D	576	542	567	515
Total Clearcut	3,531	3,921	3,654	2,987
Partial Cut	420	790	259	319
Total	3,951	4,711	3,913	3,306

Indirect Effects

All of the areas proposed for harvest would be restocked within 5 years either by natural or artificial regeneration. Where indicated, precommercial thinning could be conducted approximately 15 years after harvest. The need for artificial regeneration and precommercial thinning is addressed along with the rotation age for each unit in the final silvicultural prescriptions. Following are discussions of the indirect effects of the alternatives on growth and yield, regeneration, and precommercial thinning.

Long-Term Growth and Yield

Timber harvesting would convert overmature, uneven-aged stands to faster growing, early seral, even-aged stands. Harvesting would raise soil temperatures, accelerating decomposition and the availability of nutrients for tree growth. Total yield per acre would be higher and defect lower in second-growth stands. The magnitude of this effect on the Polk Inlet Project Area would be directly related to the number of acres harvested.

Open conditions created by clearcutting would allow both Sitka spruce and western hemlock to regenerate rapidly. On average, spruce comprises about 40 percent of the volume in even-aged stands 75 to 100 years after harvest, compared to about 20 percent or less in existing overmature stands.

All stands proposed for harvest are overmature and well beyond the age of maximum average annual growth. All old-growth stands not harvested would remain in this self-perpetuating stage, where growth and mortality are essentially equal.

Regeneration

The Forest Service is required by law, regulation, and policy to plan timber harvest only where there is assurance that such land can be regenerated within 5 years following completion of harvest. Current management prescriptions for harvest units in the Polk Inlet Project Area specify natural regeneration to restock most clearcut units. Artificial regeneration by hand planting would serve as the backup method for units that cannot be certified as adequately regenerated within 5 years after harvest. Some hand planting of Alaska yellowcedar would be prescribed to maintain species composition. It is not anticipated that burning for site preparation would be necessary.

Precommercial Thinning

Natural regeneration often results in overstocked stands with up to 5,000 stems per acre in some unplanted sites. Although these stands would thin themselves naturally, production of usable wood fiber could be accelerated if stocking were reduced through use of precommercial thinning (Harris and Farr 1974). Precommercial thinning would increase each tree's growing space through the systematic regulation of growing stock. This regulation reduces competition for sunlight and nutrients and allows Understory plants and remaining conifers grow at accelerated rates for longer periods than unthinned, second-growth stands. This treatment would be done on stands approximately 10 to 25 years following harvest. All units in each action alternative prescribed for clearcutting would be proposed for precommercial thinning. This would maximize growth and minimize the length of rotation. Highest priority for thinning would be given to the units with the highest average site index. Appropriate stocking levels and predicted future stands at rotation are detailed in each unit's silvicultural prescription.

Harvest units that were previously clearcut but not precommercially thinned should be evaluated for treatment according to the schedule set out in Table 4-34. The values shown in the table were developed using Stand Projection System (SPS) software. Numerous iterations were modeled for each site index to determine optimum stocking levels and ages for thinning. Assumptions were naturally regenerated stands averaging 4,000 trees per acre of western hemlock.

Table 4-34

Precommercial Thinning Target Stocking Levels for Naturally Regenerated Stands of Western Hemlock in Southeast Alaska

Site Index	Thin at Age	Thin to Trees/Acre	Rotation Age	DBH at Rotation	MBF/Acre at Rotation	BF/Log Rotation
41-50	22	800	95	10	26	50
51-60	19	600	85	12	33	60
61-70	16	550	85	14	53	90
71-80	14	550	75	15	56	100
81-90	16	500	75	16	70	110
91+	17	450	65	17	79	130

SOURCE: Stand Projection System (SPS); Mehrwein et al. 1993.

Cumulative Effects

Plant Succession

Following harvest and reforestation, the managed forests in the Polk Inlet Project Area would go through distinctive successional stages which are generally applicable to all units proposed for clearcut harvest under the action alternatives. Characteristics such as height, diameter, and productivity vary according to site class (discussed previously in this section). However, second-growth stands would show less variability in tree diameter and height than the old-growth stands they would replace (Alaback 1984).

Seedling/Sapling Stage

The first 20 years following harvest is referred to as the seedling/sapling understory colonization stage. During the first 5 years following harvest, there would be a rapid establishment of tree species and colonization by a number of species of shrubs, forbs, and grasses. Increased temperatures and sunlight would stimulate breakdown of organic material, increasing nutrient availability and vegetation growth. Species such as Alaska blueberry and red huckleberry especially, would increase in productivity because of vigorous sprouting from underground stems (Alaback 1984). Other species of blueberries and huckleberries, salmonberry, and residual western hemlock trees also would respond positively to the removal of the tree canopy. Mosses, lichens, forbs, and shrubs that thrive best in the shade and protection of mature overstory would be reduced in vigor and competitive ability. Because of the removal of overstory, adjacent stands would be more susceptible to windthrow. Understory development along the edge of adjacent timber stands would increase because of additional sunlight.

Between years 5 and 20, Sitka spruce and western hemlock seedlings would grow into a young forest averaging about 20 feet in height and 1 to 3 inches in diameter at breast height (DBH). Stocking densities may be on the order of 3,000 stems per acre (Forest Service 1992). Understory production of woody species is at its highest at this stage, especially in *Vaccinium*-dominated sites. Larger dead materials from the original stand continue to decompose, and the stand edge stabilizes, resulting in less windthrow. At the end of this stage, these stands would be considered for precommercial thinning as competition for growing space begins to reduce growth rates. In an effort to maintain a natural species mix, precommercial thinning would likely favor a leave species composition of about 60 percent western hemlock, 40 percent Sitka spruce, and a small cedar component.

All Polk Inlet Project harvest units would be in this stage in the year 2004 at the end of the KPC long-term contract. Assuming that all harvest is completed during 1994 through 1997, these harvest units would remain in this stage until about 2015.

Pole/Young Sawtimber Stage

Between years 25 and 85 following harvest, trees grow at their fastest rate, averaging about one 1 1/2 feet in height per year. The first 30 years of this stage are sometimes referred to as the understory exclusion stage. During this stage tree crowns would close to form a dense canopy, which results in a rapid reduction in understory biomass and an increase in dense moss. Canopy closure is delayed in precommercially thinned stands, which can develop a two-layered canopy with western hemlock in the lower tier. At age 50, tree heights would range from about 45 to 90 feet and DBH's would be about 7 to 14 inches, depending on site class.

In years 50 to 85, the stand remains closed. At age 85, diameter growth would slow as competition between trees increase, and trees would range from about 60 to 120 feet in height. This would be the proposed rotation age for most stands in the Polk Inlet Project Area. The culmination of mean and periodic annual increment of wood fiber would occur during this time. It is assumed the demand for wood products coupled with new harvesting technology would make these stands commercial at this age and size.

Mature Sawtimber Stage

From years 85 to 125, the stand would become mature. At age 125, tree heights would range from about 75 to 150 feet with diameters ranging from 11 to 21 inches, depending upon site productivity. Some trees would die while others would become dominant in size. Wood decay and defect would become an increasingly larger component of the standing timber volume. Moss would continue to dominate the understory, except in canopy gaps that allow sufficient sunlight for herbaceous plants. This would be the traditional rotation age, when a regenerated stand would be considered for harvest. For those stands to be managed for longer rotations, the above structural characteristics would continue into the later stages of the stand (125 to 160 years) with continued slow growth and occasional openings in the canopy. Polk Inlet Project harvest units would enter this stage about the year 2120.

Old-growth Stage

The final successional stage is the old-growth stage, which would apply to stands that are prescribed to be managed for old-growth conditions or stands that have been deferred from harvest. The physical structure of the old-growth understory and overstory is considered the most diverse of all stages of succession (Alaback 1982). Stands are characteristically multistoried with a large overmature overstory composed of live and dead trees and an understory of mostly shade-tolerant western hemlock. The understory would continue to renew itself through small windthrow events, creating openings where new trees and shrubs would regenerate. Patches of shrubs, tree saplings, and forbs would alternate with patches of overmature timber, creating a complex multi-layered mosaic. Wood decay and defect would become a significant component of the standing timber volume.

Projected Harvest Through 2004

The TLMP Draft Revision (1991a) calls for a second entry into the Project Area to occur before contract completion in 2004 (see Appendix A). This entry proposes a harvest of 80 MBF from MA's K18 (the eastern portion of the Project Area) and K19 (which borders the Project Area on the east). It is assumed that 60 percent of this volume of 48 MMBF will come from K18 in the Project Area. Assuming an average of 27 MBF per acre, this translates into about 1,778 acres.

Table 4-35 presents the acreage of old growth and tentatively suitable and available CFL remaining beginning with pre-logging conditions and continuing through the end of the contract in 2004. Depending on the alternative, cumulative harvest of old growth would range from 27,430 to 28,244 acres by 2004. Similarly, cumulative harvest of tentatively suitable and available CFL would range from 21,305 to 21,810 acres. As a result, from 69 to 70 percent of the pre-logging old growth and from 67 to 68 percent of the pre-logging tentatively suitable and available CFL would remain unharvested in 2004.

Cumulative Harvest Through 2054

According to the Draft TLMP Revision (1991a), nearly all tentatively suitable and available CFL in the Project Area will have been harvested by the end of the first forest rotation in 2054. About this time, significant second-growth acres will become available for harvest. The most recent timber harvest schedule for the Project Area (based on the preferred alternative in the TLMP Revision) is presented by decade through 2054 along with cumulative harvest in Table 4-36. These data indicate a relatively even harvest rate in the Project Area with harvest ranging from 5,305 to 7,436 acres during 5 of the 6 decades. During Decade 5, 2035 to 2044, harvest is projected to jump up to 12,760 acres. Cumulative harvest through 2054 is projected to be 64,975 acres. As a result of this harvest, about 28 percent of the pre-logging old growth and 11 percent of the pre-logging suitable and available CFL would remain unharvested in 2054.

Table 4-35

Acreage of Old Growth and Suitable and Available CFL (Suitable-Available) Remaining from Pre-logging Conditions through Reasonably Foreseeable Actions

	Alternative F2		Alternative 3		Alternative 4		Alternative F5	
	Old Growth	Suitable-Available	Old Growth	Suitable-Available	Old Growth	Suitable-Available	Old Growth	Suitable-Available
Pre-logging Conditions—1954	90,060	67,031	90,060	67,031	90,060	67,031	90,060	67,031
Existing Conditions								
—1994[1/]	71,374	53,082	71,374	53,082	71,374	53,082	71,374	53,082
—1995[1/]	68,787	50,972	68,787	50,972	68,787	50,972	68,676	50,972
Polk Inlet Project Proposed								
1998	65,401	47,586	64,771	46,956	65,275	47,460	65,819	48,115
Reasonably Foreseeable								
—2004[2/]	63,623	45,808	62,993	45,178	63,497	45,682	64,041	46,337
% of Pre-loggin Conditions	71	68	70	67	71	68	71	69
Cumulative Harvest	26,437	21,223	27,067	21,853	26,563	21,349	26,019	20,694

SOURCE: Forest Service, Ketchikan Area, database.

1/ 1994 existing conditions represent conditions under Alternative 1a. 1995 existing conditions represent conditions under Alternative 1.
2/ Assumes that 60 percent of the 80 MMBF scheduled for MA K18 and K19 (see Appendix A) would come from the Project Area, since MA K19 is outside the Project Area. This is the equivalent of 48 MMBF, which translates to about 1,778 acres at 27 MBF/acre.

Table 4-36

Cumulative Timber Harvest for the Polk Inlet Project Area (acres)

	Harvest	Suitable &Available CFL Remaining[1/]	Total Old Growth Remaining
Pre-logging Condition (1954)		67,031	90,060
Past Harvest (1954-1994)	18,686	53,082	71,374
Past Harvest (1994-1995)	2,587	50,972	68,787
Proposed Harvest (1995-1998)[2/]	4,703	46,269	64,084
Reasonably Foreseeable Harvest			
(1998-2004)[3/]	1,778	44,491	62,306
Projected Harvest (2005-2014)	7,436	37,055	54,870
Projected Harvest (2015-2024)	5,894	31,161	48,976
Projected Harvest (2025-2034)	5,305	25,856	43,671
Projected Harvest (2035-2044)	12,760	13,096	30,911
Projected Harvest (2045-2054)	5,826	7,270	25,085
Cumulative Harvest through 2054	64,975		
% Remaining in 2054		11	28

SOURCE: Forest Service, Ketchikan Area, database.

1/ Note that many past harvest acres did not occur on suitable and available CFL as currently defined.
2/ Assumes a harvest of 4,703 acres for Polk Inlet Project which is equivalent to the harvest acreage for Alternative 2, in the Draft EIS.
3/ Assumes that 60 percent of the 80 MMBF scheduled for Management Areas (MA) K18 and K19 (see Appendix A) would come from the Project Area, since MA K19 is outside the Project Area. This is the equivalent of 48 MMBF which translates to about 1,778 acres at 27 MBF/acre.

Cumulative Harvest on Prince of Wales Island

Table 4-37 presents the most recent timber harvest schedule for all MA's on Prince of Wales Island and neighboring islands (based on the preferred alternative in the TLMP Revision) by decade through 2054. The management areas are grouped into four areas based on their proximity and isolation from the Island road system: (1) northern road system including the Lab Bay Project Area; (2) north-central road system including most of the Central Prince of Wales and Control Lake Project Areas; (3) south-central road system, including the Polk Inlet Project Area; and (4) isolated areas, including the Heceta Project Area (see footnotes to Table 4-37).

The projected harvest from the three road system areas combined begins at 994 MMBF during 1995 to 2005 (decade 1), steadily increases to 1,626 MMBF during 2035 to 2044 (decade 5), before dropping back to 1,043 MMBF during 2045 to 2054 (decade 6). Projected harvest for the south-central road system generally follows the same pattern, with the lowest harvest occurring in Decade 1 and the greatest harvest occurring in decade 5.

Table 4-37

Projected Harvest by Decade and Geographic Area for Prince of Wales Island in Acres and Volume (MMBF)1/ (Assuming Only Old Growth is Harvested)

	Northern Road System2/		North-Central Road System3/		South-Central Road System4/		Isolated Areas 5/	
	Acres	Volume	Acres	Volume	Acres	Volume	Acres	Volume
Tent. Suit. & Available OG	64,500 6/	1,742	187,495 7/	5,062	72,912 8/	1,969	104,914	2,833
Projected Harvest (TLMP)								
1995-2004	7,001	189	23,339	630	6,481	175	13,883	375
2005-2014	7,841	212	21,161	571	8,136	220	32,266	871
2015-2024	8,635	233	28,399	767	7,024	190	12,058	326
2025-2034	9,396	254	36,118	975	12,000	324	9,506	257
2035-2044	6,025	163	32,984	891	21,188	572	11,041	298
2045-2054	11,424	308	19,407	524	7,832	211	10,110	273
Total Harvest 1995-2054	50,322	1,359	161,408	4,358	62,661	1,692	88,864	2,399
Percent of suitable-available old growth available to absorb falldown9/	22%		14%		14%		15%	

SOURCE: Forest Service, Ketchikan Area, database.

1/ Assumes an average volume of 27 MBF/acre.
2/ Includes MA's K01 and K03, MA K02 is LUD II.
3/ Includes MA's K07, K08, K09, K10, K14, and K15. MA K06 is LUD II and K16 is Wilderness.
4/ Includes MA's K17, K18, and K21.
5/ Includes MA's K04, K05, K11, K19, K20, K22, K24, K25, and K28. MA's K12, K13, K23, K26, and K27 are LUD II or Wilderness.
6/ The currently ongoing Lab Bay site-specific analysis, which includes field verification, is expected to result in a lower estimate of tentatively suitable and available old growth based on preliminary data.
7/ These acres include most of the 58,352 acres that were deferred from consideration by the Central Prince of Wales Project ID Team because of soils and steep slopes, potential regeneration problems, volume, economics, etc. These acres have yet to be field-verified but suggest that substantial area is at risk of being found unsuitable.
8/ This estimate of suitable-available old growth incorporates the results of the Polk Inlet Project site-specific analysis which included field verification.
9/ Falldown refers to the area determined to be unsuitable or inoperable on the basis of ground verification or land selections by the State and Native corporations. It also includes areas deferred from harvest due to cumulative visual or watershed disturbance thresholds or due to economic considerations.

The analysis shows that these harvest levels could be supported by the tentatively suitable and available old-growth timber supply with up to 16 percent available to absorb falldown or other changes to available timber supply for the three road system areas combined. Potential to absorb falldown for the four individual areas ranges from 14 to 22 percent.

It should be noted that the Central Prince of Wales (CPOW) multi-entry logging plan (MELP) developed for the CPOW Draft EIS deferred entry into 58,352 acres because of soils and steep slopes, potential regeneration problems, low-volume areas, poor economics, and other reasons. The CPOW MELP process assumed that many of those acres would not be available for harvest in the future. These assumptions were used in the CPOW cumulative effects analysis. It should also be noted that the CPOW project received less intensive field verification than more recent EIS projects on the Ketchikan Area, such as Polk Inlet. Although most would agree that the categories used in the CPOW MELP process to represent areas at risk for falldown are valid, there has been much debate on the methodology used to determine suitable and available timber base acres. The Polk Inlet cumulative effects analysis leaves most of the 58,352 acres in the suitable and available base. This assumes that the potential falldown categories used in the Polk Inlet analysis will give a fair representation of conditions to be found in other project areas including the CPOW project. For example, a large portion of the CPOW acres deferred were in the poor economic category. Changes in economic conditions could make these areas more economically viable in the future. It is prudent to track these acres in the timber base with the associated risk to falldown rather than eliminating them from the timber base.

Falldown

Falldown refers to the difference between planned or scheduled harvest and that which is attained after implementation. Falldown can be categorized in terms of hard falldown and soft falldown.

Hard Falldown

Hard falldown occurs during harvest unit planning/design, layout, and at the time of harvesting. Examples of hard falldown include local areas of poor soil stability, rock outcrops, v-notches, non-commercial forest sites, and sites that cannot be reforested in five years. Hard falldown also includes lands required for buffers along previously unmapped streams and lands selected by the State or Native Corporations that have been conveyed to their ownership.

Areas that create hard falldown are mapped and entered into the appropriate databases that adjust the suitable and available acreage for the Forest. These adjustments ultimately affect the Forest database from which Forest Plan allowable sale quantity (ASQ) is calculated.

Soft Falldown

Soft falldown occurs during harvest unit planning/design, layout, and occasionally at the time of harvesting. Examples of soft falldown include deferring potential harvest units that are adjacent to previously harvested units that have not reached sufficient new tree growth to meet NFMA-created opening requirements; deferring potential harvest units in areas/watersheds that have exceeded Forest Plan cumulative effects thresholds; deferring potential harvest units to meet TTRA proportional harvest requirements; and deferring portions of potential harvest units that require different logging systems than planned (e.g., small portion that would require helicopter yarding). Also included in the soft falldown category are potential harvest units (or portions of) that are deferred to meet newly defined resource objectives that may not have been included in a current Forest Plan. Examples of this include areas deferred to protect potentially significant karst features and areas deferred in Habitat Conservation Areas (HCA's) for old growth habitat. These type of deferrals are usually interim to allow the forest planning process time to more adequately deal with them.

Areas that create soft falldown are generally short term deferrals (5-10 years) and do not affect the Forest Plan ASQ data base. However, the areas deferred on an interim basis (karst, HCA's) may result in adjustments to the Forest Plan ASQ data base when fully analyzed and incorporated in the Forest Planning process.

Pursuant to Section 301(e) of the Tongass Timber Reform Act of 1990, the Irland Group was contracted by the Forest Service to prepare an "Assessment of Adequacy of Timber Supply and Analysis of Potential Effects of Eliminating the Long-Term Timber Sale Contract Area," (The Irland Group 1991). The Forest Service responded with an "Evaluation of the Irland Group Report" in April 1992 (Forest Service 1992i). Both documents include evaluation of falldown factors. The Irland Group estimated potential falldown at 23 percent, while the Forest Service estimated potential falldown of 31 percent. The 31 percent includes 21 percent soft falldown and 10 percent hard falldown. The Polk Inlet cumulative effects analysis uses the estimated 31 percent falldown as represented by the Forest Service response to the Irland Group.

Changes in Timber Supply

This section of the cumulative effects analysis describes factors that can affect the timber supply. Changes in timber supply can be caused by a number of factors that can be divided into four groups—economic factors, suitability factors, changes in land uses, and reductions in clearcutting. It should be noted that changes in land uses due to more restrictive standards and guidelines can lead to changes in land allocations. When these areas are included in the suitable and available timber base, they can lead to project falldown. If these areas are included in land allocation changes, they are no longer considered part of the suitable and available timber base and, thus, would not be considered as falldown. Since land allocation decisions are not part of this project level analysis, the more restrictive standards and guidelines discussed in the following sections will be considered as potential project falldown.

Economic Factors

The economic factors, which have been estimated at about 21 percent under recent economic conditions, depend on the economic situation the timber industry will experience in the future (Forest Service 1992i). Lands that fall into the economic category usually require more miles of new road construction to access for logging, or more expensive logging systems (i.e., helicopter) to harvest the timber. Timber stands in these areas often contain lower volumes per acre, thus affecting the cost effectiveness of harvesting. Economic criteria are not used in defining tentatively suitable and available lands on the Tongass because the economic attractiveness of harvesting varies with timber prices and the potential exists for improved and more efficient harvest systems to be developed over time. For example, helicopter logging, which was once considered uneconomic, has become more common in Southeast Alaska and is expected to be a regular component of logging system capability in the future.

Based on information in the Economic and Social Environment section of this chapter, 16 percent (Alternative 4) to 39 percent (Alternative F5) of the alternative volume could be at risk of falldown for economic factors. The at-risk areas include Coal Bay and Sunny Creek geographic areas and helicopter yarding volume. For example, the analysis indicates that increases in values and/or efficiencies of an estimated $29.70/MBF would be needed to make the Coal Bay geographical area positive. Another option can be to mix or combine less economic areas with more positive areas to make a combined package that is economical. If the Coal Bay area could not be made positive and was not able to sell, it would represent an estimated 10 MMBF volume or 8 percent falldown for economic factors in the alternatives that include this area.

Suitability Factors

The suitability factors, which have been estimated at about 10 percent (Forest Service 1992i), include lands conveyed to the State and Native corporations, and areas determined to be unsuitable on the basis of ground verification. Ground verification can reveal local areas of poor soil stability, rock outcrops, or V-notches that are not suitable for timber production. Ground verification (and other analysis) can also reveal a substantial number of previously unmapped streams that require buffers. It should also be noted that some areas are found that qualify to be in the productive timber base but were not included. Such areas are mapped and put back into the base and treated accordingly on the ground. The 10 percent estimate noted above is consistent with the falldown experienced during ground verification of the harvest unit pool for the Polk Inlet Project (Mehrwein et al 1993).

It should be noted that final layout of harvest units can be expected to identify additional local areas not suitable for timber production. Ground verification associated with the Polk Inlet Project has been designed to minimize this additional falldown due to final layout.

Based on the Forest Service response to the Irland Report, the 10 percent falldown due to suitability factors is not likely to change. This leaves only 4 to 12 percent (average 6 percent) available to absorb falldown for economic reason (21 percent). The timber supply can support the projected harvest through 2054 only if economic conditions improve substantially over time. If economic conditions do not change and falldown due to economic factors remains at about 21 percent, total falldown would continue to equal about 31 percent. Projected harvest for the three road system areas combined is 7,409 MMBF over the six decades and the tentatively suitable and available timber supply is 8,773 MMBF. A 31 percent falldown scenario would result in 6,053 MMBF being suitable and available for harvest. Under this scenario, the projected harvest would need to be reduced by 1,356 MMBF or about 18 percent over the six decades.

Changes in Land Uses

A third category of potential change in timber supply could be associated with changes in land uses due to more restrictive standards and guidelines. This category merits some discussion when looking at longer term timber supply projections, because it could reflect potential changes in land use allocation. This category could include land use changes to address concerns for well distributed viable wildlife populations, karst-related resources, etc.

To assure maintenance of well-distributed viable populations of wildlife species (especially those associated with old-growth habitats), areas of old-growth timber may need to be deferred from harvest for some period of time into the future. A Draft Environmental Assessment was issued in the fall of 1994 by the Regional Forester that indicated 30 percent of the remaining available old growth would be protected until the Forest Plan Revision process is completed. Even though the areas identified in the EA to be protected are only interim, the percentage is an indication of the potential for a change in timber supply associated with old-growth habitat.

Karst geology and resources associated with it have received much interest in recent months. Prince of Wales Island and most of the islands off its west coast have large areas of karst geology. Numerous caves, sensitive geologic features and extensive hydrologic systems within karst areas can be vulnerable to land management activities, in particular timber harvesting and road construction. The Ketchikan Area has developed a karst vulnerability rating system that rates karst areas in high, medium and low categories with the high category expected to be most restrictive to timber harvest activities. The Lab Bay Project Area, located in the North Central Road System area (Table 4-37), has approximately 40 percent of its suitable and available timber base in karsted areas with a high vulnerability rating. This

project area has a higher percentage of karst than most of the future project areas, but gives an indication of the magnitude of potential change in timber supply associated with karst resources.

Reduction in Clearcutting

The fourth group of potential change in timber supply factors is caused by a reduction in clearcutting due to amenity values, such as visual quality and protection of new recreation places, and ecosystem values. Movement to harvesting methods other than clearcutting to meet amenity or ecosystem values will result in falldown from Forest Plan volume projections (at least during the current rotation) that are based more on clearcutting systems. For example, in the Polk Inlet Project Area approximately 40 percent of the project unit pool acres would receive treatment other than normal (Type A or C) clearcuts. This will result in an estimated 10 percent falldown in relation to regular clearcutting for the unit pool.

Conclusions

The indicators of potential changes in timber supply associated with potential changes in land uses and reductions in clearcutting (30 percent old-growth habitat, 40 percent karst, 10 percent clearcutting) appear to add to a total of 80 percent of the suitable land base. However, it is not likely that these areas would be additive if implemented. For example, resource value concern areas often coincide and when an area is protected for one reason other resources usually benefit. In addition, the percent of old growth and karst areas cited above could easily be much higher than the average percentage for the total area included in this analysis. Because of these land use allocation efficiencies, it is reasonable to estimate the net change in timber supply due to the above at approximately 30 percent.

The Control Lake Timber Sale EIS, which is currently in progress, will include updating of various resource databases for much of the Ketchikan Area, including Polk Inlet. These updates will be used in the cumulative effects and timber supply analyses for the Control Lake project. Streams databases will be updated to better represent conditions being found during ground verification and project implementation. Additional analysis of slopes, landslides and V-notches in conjunction with soils will help identify areas that often are inoperable for logging. Logging and transportation analysis for future projects will be done to quantify how much of the suitable and available timber base is in the more expensive economic category. Karst vulnerability rating will also be done to quantify the potential effects on timber supply of managing these resources. The Control Lake updating was designed specifically to help address the areas of potential changes in timber supply discussed above and is expected to provide more precision to the quantification of the potential falldown categories. The falldown figures used in the Polk Inlet analysis are based on observations of actual falldown encountered during previous project implementation and ongoing project analysis, and is expected to fall within a reasonable range of the Control Lake update results/findings. Results of the Control Lake effort should be available in Spring 1995 and are planned to be used by the Tongass Land Management Planning Team for the TLMP Revision process.

Mitigation

In order to maintain high abundance of Alaska yellowcedar in selected harvest units with plant associations favoring yellowcedar growth, partial cutting would be prescribed to provide seed and shelter for yellowcedar regeneration (Mitigation Measure T1). Harvest units where this measure would apply are identified in Appendix B, on the unit cards, and in the silvicultural prescriptions.

Monitoring

Forest-wide monitoring identified in the TLMP Draft Revision (1991a) includes implementation monitoring to verify that timber activities are adhering to applicable timber management standards and guidelines (Timber Monitoring Item 1), effectiveness monitoring to verify that

the effects of timber activities on other resources are consistent with expectations (Timber Monitoring Item 2), and implementation monitoring to verify that harvested forest lands are restocked within 5 years after harvest (Timber Monitoring Item 3).

Project-specific monitoring has been identified to monitor the implementation and effectiveness of the four types of clearcutting with reserve trees prescribed for Polk Inlet Project units as an ecosystem management measure. This monitoring will include the preparation of a brief report by wildlife and visual resource specialists, based on ground observations and comparisons with unit cards and silvicultural prescriptions.

Wildlife

Key Terms

Carrying capacity—the maximum number of a wildlife species that a certain area will support through the most critical period of the year.
Habitat—the sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.
Habitat capability—an estimated number of animals that a habitat can sustain.
Management Indicator Species (MIS)—species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management activities.
Viable population—the number of individuals of a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations, well distributed throughout their range in the national forest.
Wildlife Analysis Area (WAA)—division of land identified by the Alaska Department of Fish and Game (ADF&G) and used by the Forest Service for wildlife analysis.

Introduction

This analysis of the environmental consequences of the alternatives on wildlife considers the direct, indirect, and cumulative effects of timber harvest in the Project Area. Direct and indirect effects are projected to 1997, the anticipated end of implementation of the Polk Inlet Project; to 2004, which includes the reasonably foreseeable future and the end of the KPC Long-term Sale Contract; and to 2054, to show the cumulative impacts of projected harvest through the first rotation and to show the cumulative impacts of past and proposed timber harvest.

Effects on Wildlife Habitats

Each of the action alternatives would result in harvest of wildlife habitats. Forest Plan standards and guidelines result in avoidance or substantial reduction in potential impacts to beach fringe, estuary fringe, and riparian habitats in each alternative. Scrub forest, inland mesic, and alpine/subalpine habitats are also slightly affected because of low productivity, inaccessibility, and/or Forest Plan standards and guidelines. Changes throughout the Project Area for these habitats are 1 percent or less for each alternative (Table 4-38).

The largest habitat effects are on old-growth forest habitats. The action alternatives result in the harvest of 4 to 6 percent of the old-growth forest existing after full implementation of the 1989-1994 EIS. Percent change in habitat is presented relative to Alternative 1 in Table 4-38. Acreages presented for Alternative 1a represent the habitat acreages available if all harvest was stopped at the date of the Polk Inlet Project Record of Decision (ROD).

Table 4-38

Acreage of Wildlife Habitats Proposed for Harvest and Percent Change[1/,2/] from Existing Acres for each Alternative

	Alt. 1a		Alt. 1		Alt. F2		Alt. 3		Alt. 4		Alt. F5	
	Harvest	% Chg	Harvest	% Chg	Harvest	% Chg	Harvest	% Chg	Harvest	% Chg	Harvest	% Chg
Beach Fringe	-44	-1	0	0	0	0	0	0	0	0	0	0
Estuary Fringe	-15	-1	0	0	0	0	0	0	0	0	0	0
Riparian	-253	-1	0	0	379	2	579	2.5	446	2	331	2
Inland Mesic	0	0	0	0	0	0	0	0	0	0	0	0
Scrub Forest	-45	+	0	0	68	1	82	1	50	1	60	1
Old Growth VC4	-797	-3	0	0	1,691	6	2,102	7	1,742	6	1,422	5
Old Growth VC5	-830	-4	0	0	1,116	6	1,224	6	971	5	1,012	5
Old Growth VC6	-332	-3	0	0	430	4	496	5	529	5	287	3
Old Growth VC7	-280	-4	0	0	149	2	194	3	270	4	136	2
Alpine/Subpine	-17	+	0	0	135	1	167	1	54	+	101	1

SOURCE: Forest Service, Ketchikan Area, database.

1/ = Percent Change is from Existing Acres under Alternative 1.

2/ Acreages in habitat categories may overlap.

\+ = <.5%

Riparian—Riparian habitat is defined as the riparian management area described in the *Wetlands, Floodplains, and Riparian Areas* section. Harvest in this habitat would range from 331 acres to 579 acres in Alternatives F2 and 3, respectively. TTRA buffers, 100-foot buffers around lakes larger than 5 acres, and expanded-width buffers are not proposed for harvest. Harvested area consists primarily of riparian habitat along Class III streams and riparian habitat beyond 100 feet from the larger lakes.

Scrub Forest—Scrub forest habitats are defined based on the GIS-mapped timber type identified as low productivity forest due to muskeg and are inclusions in harvest units or road corridors. Harvest in this habitat would range from 50 to 82 acres which represents one percent or less for each action alternative.

Alpine/Subalpine—Timber harvest in this habitat would range from 54 to 167 acres, which represents 1 percent or less for each action alternative. These habitats usually consist of high-elevation forests.

Old-growth Forest—The Project Area would contain 68,085 acres of forest mapped as Volume Classes 4 through 7 after full implementation of the 1989-94 EIS. An additional 21,975 acres are mapped as Volume Class 3. Alternatives F2, 3, 4, and F5 would result in the harvest of 3,386 acres, 4,016 acres, 3,512 acres, and 2,857 acres of Volume Classes 4 through 7, respectively. An additional 401 to 695 acres of land mapped as small patches of nonforested or low productivity forest types and are included within harvest units. The percentage of old growth Volume Classes 4 and 5 that would be harvested by action alternatives ranges from 5 to 7 percent. The harvest of Volume Class 6 would range from 3 to 5 percent and the harvest of Volume Class 7 would range from 2 to 4 percent. Alternative 4 would result in the largest percent harvest of Volume Classes 6 and 7 and Alternatives F2 and

F5 would result in the least. For greater detail on the amount of harvest by volume class, see the *Vegetation and Timber Resources* section of this chapter.

Effects on Management Indicator Species

The previous section discussed changes to wildlife habitats used by the MIS. This section discusses how those changes in habitats affect the potential habitat capability for each MIS. The habitat capability models that predict the capability of habitats to support selected species are not perfect reflections of actual populations in the Project Area. They represent a reasonable prediction of the potential capability of the habitats to support the species, and are designed to evaluate land management activities. Use of the habitat capability models is discussed in greater detail in *Wildlife* in Chapter 3 and in the TLMP Draft Revision (1991a). Alternative 1 would have no direct effects on habitat capabilities for any MIS, beyond those already approved and undergoing implementation. Alternative 1 represents the baseline for comparisons with other alternatives and is described in detail in Chapter 3. Alternative 1a would stop harvesting prior to full implementation of previously approved actions and, thus would result in reduced negative effects on MIS habitat capability relative to Alternative 1. The tables in this section display the changes in habitat capabilities relative to 1995 existing conditions (Alternative 1) under Alternatives F2 through F5.

Sitka Black-tailed Deer

The primary effect to deer under each of the action alternatives would be a reduction in the long-term quality of deer winter range within the Project Area. Declines in deer habitat capability as a result of the proposed Polk Inlet Project would reduce deer habitat capability between 1 percent (Alternatives F2 and F5) and 2 percent (Alternatives 3 and 4) from existing conditions (Table 4-39). The effects of timber harvest on Sitka black-tailed deer summer range would be minimal under each of the alternatives. Any potential effect to summering deer populations would occur from increased hunter access to high elevation habitats via roads constructed under this EIS.

Table 4-39

Predicted Habitat Capability for Sitka Black-tailed Deer by Alternative (1998), by WAA[1/]

WAA[2/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	107	75	73	71	71	71	71
1213	582	545	542	530	523	524	531
1214	1,633	1,456	1,429	1,371	1,376	1,358	1,376
1317	1,544	919	901	876	855	870	879
1332	350	261	255	241	238	240	240
Total	4,216	3,256	3,200	3,089	3,063	3,063	3,098
Change in Habitat capability	+56	0	-111	-137	-137	-102	
Percent Change from 1995		+1.8	0	-3.5	-4.3	-4.3	-3.2

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database. (See Table 4-56 for patch size effectiveness index values)

1/ Numbers incorporate patch size effectiveness reductions.

2/ Only that portion of each WAA within the Project Area is included.

Deer Population Objectives

ADF&G has established deer population objectives for all WAA's in Southeast Alaska for the years 1991 to 1995. The population objectives for the individual WAA's can be found in "Population Objectives-Strategic Plan for Management of Deer in Southeastern Alaska 1991-95" (ADF&G 1991).

It is difficult to compare deer habitat capabilities after project implementation with deer population objectives because the project affects only portions of five different WAA's (see Table 3-27). Deer population objectives for the WAA's recommend maintaining deer habitat capability at 75 percent of 1954 levels. Table 4-40 displays current population objectives for WAA's intersecting the Project Area and estimated deer habitat capabilities for those WAA's including portions outside the Project Area.

Table 4-40

ADF&G Sitka Black-tailed Deer Population Objectives and Habitat Capabilities for Polk Inlet Project Area WAA's by Alternative

WAA	ADF&G Population Objectives[1/]	Alternatives[2/]				
		1	F2	3	4	F5
1107	5,275	7,311	7,309	7,309	7,309	7,309
1213	906	1,039	1,027	1,020	1,021	1,028
1214	1,450	1,979	1,921	1,926	1,908	1,926
1317	1,093	1,177	1,152	1,131	1,146	1,155
1332	2,292	2,820	2,806	2,803	2,805	2,805

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database.

1/ Population objectives based on total WAA area, ADF&G 1992.

2/ Habitat capabilities are estimated for the entire WAA including portions outside the Project Area.

Estimated habitat capabilities for all WAA's in the Project Area currently exceed ADF&G objectives and continue to do so after implementation of one of the Polk Inlet action alternatives. However, habitat capabilities are close to population objectives, especially for WAA's 1213 and 1317. Continued timber harvest is likely to reduce habitat capabilities below population objectives at some point in the future, particularly in these two WAA's.

Changes in low, mid, and high quality deer winter range are indicated for each of the Project Area WAA's in Table 4-41. (See Appendix C for detailed maps displaying the availability of low, mid, and high quality winter range for Alternatives 1a, F2, 3, 4, and F5). Low quality winter range would increase by 3 percent under each of the action alternatives in relation to existing conditions. The largest percent increase would take place in WAA 1214 under Alternative 4.

Mid quality winter range would continue to decline by 4 to 6 percent from existing conditions under each of the action alternatives. The largest percent decline in mid quality winter range would take place in WAA 1332 under Alternatives F2, 3 and F5.

Additional declines in high quality winter range of 2 to 4 percent are anticipated for each of the action alternatives in relation to existing conditions. The greatest percent reduction (8) in high quality winter range would occur in WAA 1317 under timber management Alternative 3.

Table 4-41

Acreage of Low, Mid, and High Quality Winter Range for Sitka Black-tailed Deer, by Alternative[1/]

	Pre-logging	Alternatives					
WAA	1954	1a	1	F2	3	4	F5
Low Quality Winter Range (HSI < 0.2)							
1107	2,141	2,581	2,641	2,661	2,661	2,661	2,661
1213	5,809	5,909	5,909	5,929	6,050	6,049	5,909
1214	27,279	28,780	29,440	30,861	30,141	31,121	30,701
1317	18,542	27,154	27,494	28,072	28,572	28,172	27,953
1332	7,390	8,808	8,928	9,068	9,128	9,068	9,068
Total	61,161	73,232	74,412	76,591	76,552	77,071	76,292
% Change		-2	0	+3	+3	+4	+3
Mid Quality Winter Range (HSI = 0.2-0.35)							
1107	280	300	240	240	240	240	240
1213	2,684	2,634	2,684	2,684	2,643	2,684	2,684
1214	8,227	8,246	7,887	7,046	7,446	6,946	7,126
1317	6,613	6,454	6,254	6,074	5,794	6,014	6,115
1332	1,398	1,218	1,158	1,059	999	1,059	1,059
Total	19,202	18,902	18,223	17,103	17,122	16,943	17,224
% Change		+4	0	-6	-6	-7	-5
High Quality Winter Range (HSI > 0.35)							
1107	800	340	340	320	320	320	320
1213	4,946	4,847	4,827	4,827	4,746	4,706	4,847
1214	11,250	9,729	9,429	8,928	9,228	8,768	9,008
1317	13,289	4,836	4,697	4,596	4,376	4,557	4,637
1332	2,277	1,038	979	959	959	959	959
Total	32,562	20,790	20,292	19,630	19,629	19,310	19,771
% Change		+2	0	-3	-3	-5	-3

SOURCE: Forest Service, Ketchikan Area, database.

1/ Winter range quality acreages are determined from the aggregation of HSI scores output from the Tongass Deer Model (Suring et al. 1991) using the TLMP grid.

* HSI = Habitat Suitability Index.

Black Bear

Avoidance of beach fringe, estuary fringe, stream corridors, and riparian habitat under each timber harvest alternative results in a minimal decline in habitat capable of supporting black bears. Declines in bear habitat capability as a result of the proposed Polk Inlet entry in 1997 range from 1 to 2 percent of existing conditions for the four action alternatives (Table 4-42). Habitat capabilities for black bears under Alternatives F2, 3, 4, and F5 are not significantly different.

Table 4-42
Predicted Habitat Capability for Black Bear by Alternative (1998), by WAA[1/]

WAA[2/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	8	6	6	6	6	6	6
1213	42	40	40	40	39	39	40
1214	125	99	97	97	97	97	97
1317	102	69	68	68	67	67	68
1332	25	18	18	17	17	17	17
Total	302	232	229	228	226	226	228
Change in Habitat Capability		+3	0	-1	-3	-3	-1
Percent Change from 1995		+1.3	0	-0.4	-1.3	-1.3	-0.4
Disturbance Factor Index[3/]	(1.000)	(.844)	(.835)	(.835)	(.831)	(.831)	(.835)

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database.

1/ Numbers incorporate disturbance factor reductions.

2/ Only that portion of each WAA within the Project Area is included.

3/ Average reduction factor to account for disturbance associated with roads.

Marten

The primary impacts to marten under each of the action alternatives would be: (1) a reduction in the long-term quality of marten cover due primarily to the loss of high volume, old growth and associated stand attributes (e.g., snags, woody debris), and (2) an increase in road density throughout the Project Area (discussed below). Marten habitat capability, as a result of the proposed Polk Inlet entry in 1998, is expected to decline by 3 percent (habitat capable of supporting an estimated 5 to 6 marten) from existing conditions for all four action alternatives. The effects to marten under the alternatives are expected to occur immediately following timber harvest. The effects on marten habitat are not significantly different between Alternatives F2, 3, 4, and F5 (Table 4-43).

Table 4-43
Predicted Habitat Capability for Marten by Alternative (1998), by WAA[1/]

WAA[2/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	6	4	4	4	4	4	4
1213	32	31	31	30	30	30	30
1214	97	87	85	81	82	81	82
1317	91	60	58	56	54	56	56
1332	21	15	14	13	13	13	13
Total	247	197	192	185	183	184	186
Change in Habitat Capability		+5	0	-7	-9	-8	-6
Percent Change from 1995		+2.6	0	-3.6	-4.7	-4.2	-3.1

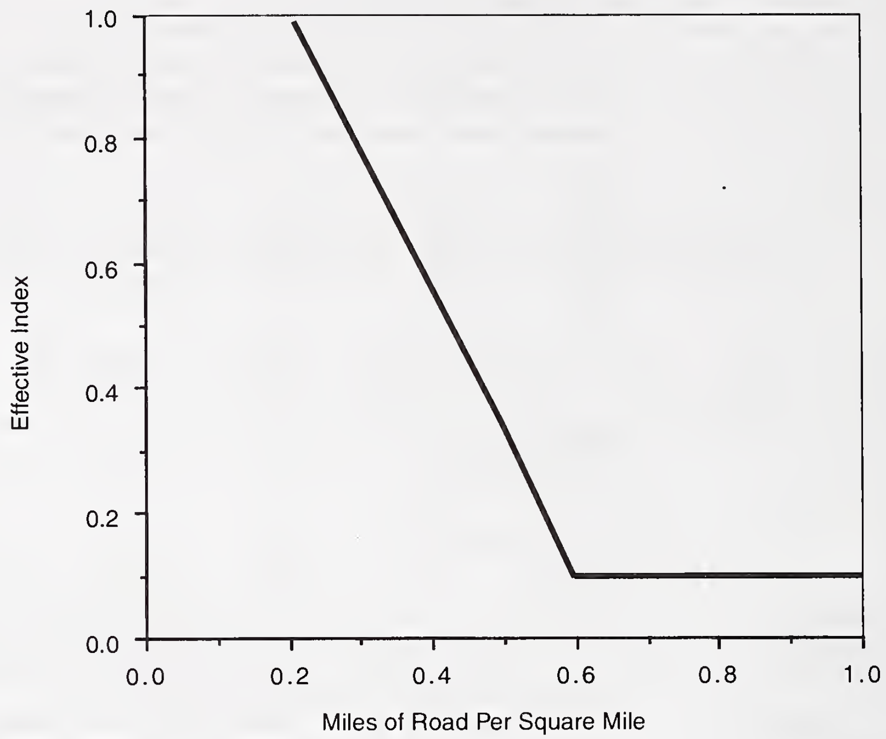
SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database. (See Table 4-44 for road effects, and Table 4-56 for patch size effectiveness index values.)

1/ Numbers incorporate patch size effectiveness reductions.
2/ Only that portion of each WAA within the Project Area is included.

Marten are trapped and can be overharvested, especially where trapping pressure is heavy. As indicated in the marten habitat capability model (Suring et al. 1991b), marten habitat capability declines precipitously as road densities increase above 0.2 mile per square mile (mi/mi^2) (Figure 4-5). Each of the action alternatives would increase road densities above existing conditions Table 4-44) and would, therefore, lower the habitat capability for marten beyond the declines from habitat reduction alone (Table 4-45). Although the overall road density is similar among the alternatives, impacts to marten would vary depending on road densities specific to individual populations. Habitat capabilities are reduced less than 1 percent due to road density when compared to 1994 conditions, but show significant reductions when compared to pre-logging (1954) conditions. This is especially important since many of the WAA's are already at suboptimal road densities.

Road density varies within individual WWA's, with density high in one section and no roads in another. An example is WAA 1214, VCU 618 (McKenzie Inlet); its road density varies from 0.6 to 1.0 mi/mi^2 for WAA 1214, and 0.5 to 0.6 mi/mi^2 within VCU 618, but road construction has been localized at the upper end of McKenzie Inlet, leaving the lower half of the inlet unaffected by road construction. In cases such as this, habitat capability is only affected by harvest. The access management plan presented in *Transportation and Facilities* is designed to reduce exposure of wildlife population to increased harvest resulting from road construction. Access management along with trapping regulations would reduce the effects due to roads.

Figure 4-5
Effect of Road Density on Marten



SOURCE: Suring et al., 1988c.

Table 4-44
Road Density (mi/mi²) by Alternative for the Polk Inlet Project Area

VCU	1a	1	F2	3	4	F5
			Alternatives			
610	0.9	0.8	0.8	0.8	0.8	0.8
611	0.3	0.2	0.2	0.6	0.2	0.2
612[1/]	0.3	0.5	1.0	0.8	1.1	1.0
613[1/]	0.3	0.4	0.6	0.6	0.6	0.6
618[1/]	0.0	0.5	0.5	0.5	0.6	0.5
619	0.8	0.8	0.9	0.8	0.9	0.9
620	1.3	1.3	1.6	1.5	1.5	1.5
621	0.9	1.0	1.2	1.5	1.4	1.2
622	0.6	0.8	0.9	1.0	1.0	0.9
624	1.3	1.5	1.6	1.6	1.6	1.6
674[1/]	0	0	0	0	0	0
675[1/]	0	0	0	0.5	0	0
Total	0.61	0.73	0.86	0.91	0.90	0.84

SOURCE: Forest Service, Ketchikan Area, database.

1/ Most or all roads in these VCU's are not connected to the island road system and, thus, would not have as large an effect on marten habitat capability as those that are connected.

Table 4-45
Effects of Road Density on Marten Habitat Capability (Worst-Case Estimate) by Alternative by WAA[1/]

WAA	1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107 Habitat Capability[2/]	6	4	4	4	4	4	4
Road Density (mi/mi^2)	0.0	0.46	0.46	0.50	0.50	0.50	0.50
Curve Value[3/]	1.00	0.40	0.40	0.30	0.30	0.30	0.30
Resulting H.C.[4/]	6	2	2	1	1	1	1
1213 Habitat Capability[2/]	32	31	31	30	30	30	30
Road Density (mi/mi^2)	0.0	0.0	0.0	0.01	0.13	0.04	0.0
Curve Value[3/]	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Resulting H.C.[4/]	32	31	31	30	30	30	30
1214 Habitat Capability[2/]	97	87	85	81	82	81	82
Road Density (mi/mi^2)	0.0	0.59	0.74	0.93	0.85	0.95	0.74
Curve Value[3/]	1.00	0.10	0.10	0.10	0.10	0.10	0.10
Resulting H.C.[4/]	97	9	8	8	8	8	8
1317 Habitat Capability[2/]	91	60	58	56	54	56	56
Road Density (mi/mi^2)	0.0	0.74	0.83	0.94	1.13	1.05	0.92
Curve Value[3/]	1.00	0.10	0.10	0.10	0.10	0.10	0.10
Resulting H.C.[4/]	91	6	6	6	5	6	6
1332 Habitat Capability[2/]	21	15	14	13	13	13	13
Road Density (mi/mi^2)	0.0	1.32	1.50	1.62	1.65	1.57	1.62
Curve Value[3/]	1.00	0.10	0.10	0.10	0.10	0.10	0.10
Resulting H.C.[4/]	21	2	1	1	1	1	1
Resulting Total H.C.	247	50	48	46	45	46	46
Project Area Road Density	0.0	0.61	0.73	0.86	0.91	0.90	0.84

SOURCE: Tongass marten model (Suring et al. 1991).

1/ Represents a worst-case estimate because it assumes all roads are open roads and are connected to the island road system. Furthermore, it assumes uniform road density within each WAA, which is not the case. This results in underestimates of habitat capability, especially in WAA's 1214 and 1317, which have large, unroaded areas.

2/ Original habitat capabilities with patch size effectiveness.

3/ Curve values taken from Tongass marten model (Suring et al. 1991).

4/ Resulting H.C. derived from habitat capabilities x curve values.

Gray Wolf

None of the action alternatives is expected to reduce wolf habitat capability from existing conditions (Table 4-46). This is primarily because of the small overall decline (1 to 2 percent) in deer habitat capability anticipated over this time period (see Table 4-39). Habitat capability for wolves is calculated using deer densities as an estimate of available biomass. As a result, changes to wolf habitat capabilities are directly proportional to habitat capabilities for deer. Because of this relationship, a large decline in deer habitat capability is required for the model to predict a decline in the habitat capability for wolves.

Table 4-46

Predicted Habitat Capability for the Gray Wolf by Alternative (1998), by WAA[1/]

WAA[2/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	0.4	0.3	0.3	0.3	0.3	0.3	0.3
1213	2.5	1.9	1.9	1.9	1.9	1.9	1.9
1214	5.9	5.2	5.1	4.9	4.9	4.9	4.9
1317	5.5	3.3	3.2	3.1	3.1	3.1	3.2
1332	1.3	0.9	0.9	0.9	0.9	0.9	0.9
Total	15.6	11.6	11.4	11.1	11.1	11.1	11.2
Change in Habitat Capability		+0.2	0	-0.3	-0.3	-0.3	-0.2
Percent Change from 1995		+1.8	0	-2.6	-2.6	-2.6	-1.8

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database.

1/ Numbers are based on deer habitat capabilities that incorporate patch size effectiveness reductions.

2/ Only that portion of each WAA within the Project Area is included.

As with marten, wolves are susceptible to increased harvest when road densities increase (Kirchhoff 1992). Road densities within the Project Area range from 0.0 to 1.6 mi/mi^2 under the alternatives for both VCU's and WAA's (Table 4-44). Kirchhoff (1991) states that wolf populations are extremely vulnerable to harvest when road densities approach 0.93 mi/mi^2. TLMP Draft Revision Standards and Guidelines set 1.0 mi/mi^2 as the threshold for the implementation of protective measures within a WAA. In addition to road densities, saltwater coastlines also provide increased access to wolves, resulting in higher harvest paths. The TLMP Draft Revision (Standards and Guidelines) calls for the consideration of coastline access as well as road densities in evaluating effects on wolf populations. Four major inlets totalling 183 miles of coastline bisect the Polk Inlet Project Area; Twelvemile Arm, Polk Inlet, McKenzie Inlet, and Cholmondeley Sound. VCU's 618, 619, 621, and 674 have the highest amount of coastline with 29, 25, 24, and 29 miles, respectively.

River Otter

None of the action alternatives is expected to reduce otter habitat from existing (1995 Alternative 1 and 1a) conditions (Table 4-47). This is primarily due to the retention of otter habitat in beach fringe, estuary fringe, stream corridors, and riparian habitat.

Table 4-47
Predicted Habitat Capability for River Otter by Alternative (1998), by WAA

WAA[1/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	0	0	0	0	0	0	0
1213	9	9	9	9	9	9	9
1214	24	21	21	21	21	21	21
1317	17	11	11	11	11	11	11
1332	1	1	1	1	1	1	1
Total	51	42	42	42	42	42	42
Change in Habitat capability0		0	0	0	0	0	
Percent Change from 1995		0	0	0	0	0	0

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database.

1/ Only that portion of each WAA within the Project Area is included.

Vancouver Canada Goose

The primary impact to the Vancouver Canada goose under each of the action alternatives would include reductions in the availability of old-growth forest nesting sites associated with open bodies of water. Declines in goose habitat capability are expected to occur immediately following timber harvest. Total reductions in goose habitat capability vary by only 2 potential geese (range = 8 to 10) or 2 to 3 percent of existing goose habitat, under all four action alternatives (Table 4-48). Harvesting of units near goose nesting sites from early April to early June could disrupt breeding efforts. Other than documented concentrations of geese at Twelvemile and Dog Salmon creeks, no other goose nesting areas have been identified within the Project Area.

Table 4-48

Predicted Habitat Capability for the Vancouver Canada Goose by Alternative (1998), by WAA

WAA[1/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. F4 1998	Alt. F5 1998
1107	13	11	10	10	10	10	10
1213	56	56	56	56	56	55	56
1214	174	160	156	149	151	149	150
1317	153	123	121	119	117	119	119
1332	44	36	34	33	33	33	33
Total	440	386	377	367	367	366	368
Change in Habitat capability	+9	0	-10	-10	-11	-9	
Percent Change from 1995		+2.4	-0	-2.7	-2.7	-2.9	-2.7

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database.

2/ Only that portion of each WAA within the Project Area is included.

Bald Eagle

The potential effect of the Project to bald eagles is limited to disturbance to nesting eagles from proposed logging operations. The extent of these impacts will vary depending on: (1) the amount of timber harvest activity occurring in the vicinity of eagle habitat under each alternative, (2) type of logging operation (e.g., helicopter logging), (3) amount of screening cover within the vicinity of nest sites, and (4) timing of logging operations relative to eagle nesting.

None of the action alternatives is expected to reduce eagle habitat from existing (1995, Alternative 1) conditions (Table 4-49). This is primarily because of retention of estuary and beach buffers that would protect nesting habitat in low-elevation, old-growth forest near coastal areas and riparian buffers along Class I and II streams.

The bald eagle and its habitat have been given special protection through the Bald Eagle Protection Act as implemented by an Interagency Agreement between the Forest Service and the USFWS (Forest Service and USFWS 1990). Among the provisions of the Interagency Agreement are: requirement of a 330-foot vegetation protection buffer around eagle nests, timing restrictions for blasting within 0.5 mile of known nests, and a requirement that formal consultation with the USFWS take place when any portion of the agreement cannot be implemented.

Table 4-49

Predicted Habitat Capability for the Bald Eagle by Alternative (1998), by WAA

WAA[1/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	1	1	1	1	1	1	1
1213	33	31	31	31	31	31	31
1214	82	67	67	67	67	67	67
1317	60	27	27	27	27	27	27
1332	3	2	2	2	2	2	2
Total	179	128	128	128	128	128	128
Change in Habitat Capability		0	0	0	0	0	0
Percent Change from 1995		0	0	0	0	0	0

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database.

1/ Only that portion of each WAA within the Project Area is included.

Of the 78 eagle nest sites in the Project Area, 18 sites are within 0.5 mile of proposed harvest units (Table 4-50). The nearest distance from an eagle nest site to a proposed harvest unit is 425 feet. Six nest sites are within 660 to 2,328 feet of harvest units proposed for helicopter logging. None of the proposed harvest units or roads are within 330 feet of an eagle nest site.

Table 4-50

Location of Eagle Nest Sites Nearest Proposed Harvest Units

VCU	Unit	Distance (ft) to Nearest Harvest Unit
611	208	922
611	215	2,441
618	216	425
618	209[1/]	1,832
618	209[1/]	2,328
619	250	1,765
619	251	2,287
619	248[1/]	2,214
619	248[1/]	2,308
620	295	1,128
621	251	581
621	307[1/]	660
621	307[1/]	699
621	264	951
621	252	1,573
621	259	1,595
621	246	1,640
621	246	1,640
621	291	1,733

SOURCE: Forest Service, Ketchikan Area, database.

1/ Helicopter logging unit.

Red-breasted Sapsucker

The primary effect to red-breasted sapsuckers under each of the action alternatives would be related to loss of low-volume, old-growth forest. Total reductions in sapsucker habitat capability range from 441 sapsuckers for Alternative F5 to 607 sapsuckers for Alternative 3 (Table 4-51). This represents a reduction in habitat capability of 4 to 6 percent of existing conditions as a result of the proposed entry into Polk Inlet. The red-breasted sapsucker's use of lower-volume old growth may indicate that regenerating second-growth stands will be used at an earlier age by this species than by some of the other MIS (Sidle 1985). Sapsuckers benefit from retention of snags and live trees within harvest units (see Mitigation section), and the reduction in habitat capability may be lessened by retaining structure within units.

Table 4-51

Predicted Habitat Capability for the Red-breasted Sapsucker by Alternative (1998), by WAA[1/]

WAA[2/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	378	297	283	265	264	265	265
1213	1,782	1,728	1,718	1,699	1,674	1,682	1,699
1214	5,539	4,958	4,799	4,457	4,519	4,440	4,500
1317	4,660	3,416	3,282	3,156	2,998	3,121	3,184
1332	976	745	680	620	606	635	619
Total	13,335	11,144	10,762	10,197	10,061	10,143	10,267
Change in Habitat Capability		+382	0	-565	-701	-619	-495
Percent Change from 1995		+3.5	0	-5.2	-6.5	-5.8	-4.6

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database (see Table 4-56 for patch size effectiveness index values).

1/ Numbers incorporate patch size effectiveness reductions.

2/ Only that portion of each WAA within the Project Area is included.

Hairy Woodpecker

The primary effect to hairy woodpecker under each of the action alternatives would be related to loss of high volume, old-growth forest. Declines in hairy woodpecker habitat capability are expected to occur immediately following timber harvest. Total reductions in woodpecker habitat capability range from 57 potential woodpeckers for Alternative F2 to 69 woodpeckers for Alternative 3 (Table 4-52). This represents a reduction in habitat capability of 4 to 5 percent of existing conditions. Hairy woodpeckers benefit from retention of large structures including snags and live trees within harvest units (see Mitigation section), and the reduction in habitat capability may be less affected by retaining structure within units.

Table 4-52

Predicted Habitat Capability for the Hairy Woodpecker by Alternative (1998), by WAA[1/]

WAA[2/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	75	29	26	24	24	24	24
1213	311	294	293	287	283	281	288
1214	965	647	624	578	590	570	584
1317	913	384	364	347	330	346	351
1332	234	70	63	56	56	57	56
Total	2,498	1,424	1,370	1,292	1,283	1,278	1,303
Change in Habitat capability		54	0	-78	-87	-92	-67
Percent Change from 1995		+3.9	0	-5.7	-6.4	-6.7	-4.9

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database (see Table 4-56 for patch size effectiveness index values).

1/ Numbers incorporate patch size effectiveness reductions.

2/ Only that portion of each WAA within the Project Area is included.

Brown Creeper

The primary effect to brown creeper under each of the action alternatives would be related to reductions in high volume, old-growth forest. Declines in creeper habitat capability are expected to occur immediately following timber harvest. Total reductions in creeper habitat capability range from 72 potential creepers for Alternative F2 to 105 creepers for Alternative 4 (Table 4-53). This represents a reduction in habitat capability of 3 to 4 percent of existing conditions.

Table 4-53

Predicted Habitat Capability for the Brown Creeper by Alternative (1998), by WAA[1/]

WAA[2/]	Pre-logging 1954	Alt. 1a 1994	Alt. 1 1995	Alt. F2 1998	Alt. 3 1998	Alt. 4 1998	Alt. F5 1998
1107	191	48	42	41	41	41	41
1213	707	690	690	687	677	669	688
1214	2,293	1,377	1,330	1,272	1,289	1,253	1,284
1317	2,077	457	434	424	401	426	427
1332	572	63	52	50	50	50	50
Total	5,840	2,635	2,548	2,474	2,458	2,439	2,490
Change in Habitat Capability		+87	0	-74	-90	-109	-58
Percent Change[2/]		+3.4	0	-2.9	-3.5	-4.3	-2.3

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database (see Table 4-56 for patch size effectiveness index values).

1/ Numbers incorporate patch size effectiveness reductions.

2/ Only that portion of each WAA within the Project Area is included.

Cumulative Effects

Cumulative effects are the result of changes in the environment caused by the interaction of natural ecosystem processes and the effects of multiple management actions. Wildlife habitat and associated wildlife populations within the Polk Inlet Project Area may be influenced by the result of multiple entries to remove timber within the Project Area, and the combined or synergistic effects of habitat loss in adjacent areas.

Cumulative effects resulting from multiple management actions within the Project Area include reductions in habitat capability of MIS due primarily to: (1) past timber harvest (e.g., 1989-94 entry into Polk Inlet), (2) proposed timber harvest (i.e., this entry), and (3) future timber harvests (i.e., long-term actions). For this analysis, it was assumed that, in the reasonably foreseeable future, an additional entry to remove 80 MMBF would be required by 2004 to meet the KPC contract and this would occur mostly in MA's K18 and K19. Since K19 is not within the Project Area, it was assumed that 60 percent of the 80 MMBF from the additional entry would be removed from K18.

Following 2004, continued harvest of suitable and available commercial forest land (CFL) through 2054 at the end of decade 6 is projected (see *Vegetation and Timber Resources* section, Table 4-36). At that time, approximately 64,975 acres of old growth would have been harvested, and 25,085 acres of old growth would remain, including 7,270 acres of suitable/available CFL. The remaining 7,270 acres of suitable/available CFL would likely be located in LUD's which dictate greater restrictions on timber harvest such as the modified landscape and scenic viewshed LUD's near Hollis, the scenic viewshed LUD across Twelvemile Arm from Hollis, the modified landscape LUD at the head of Twelvemile Arm, and the modified landscape LUD in VCU's 674 and 675 surrounding Cholmondeley Sound, as well as in isolated old-growth stands.

In decades following 2054, TLMP's scheduled harvest shifts from old growth to second growth, and from that point all suitable/available and scheduled stands previously harvested would be maintained as second growth. The remaining old-growth forest in the Project Area would be confined to isolated blocks located within Old Tom Research Natural Area and Maybeso Experimental Forest and in smaller patches or strips of old-growth forest maintained within beach and estuary fringes, riparian buffers, eagle nest buffers, and MMI IV and McGilvery soils (see *Biodiversity*, Figure 4-23). The Maybeso Experimental Forest block may be lost if its remaining old growth is harvested in the future. Although the patches and strips would likely function as linkages to other forest blocks and as travel corridors for some wildlife, it is unlikely that they would provide adequate habitat for species that require large blocks of intact old-growth forest or species that are vulnerable to edge-related predation or microclimate fluctuations.

Cumulative effects of multiple management actions in the Polk Inlet Project Area would result in reductions in the habitat capability of the MIS over the 60-year period of analysis (Table 4-54). Habitat capabilities were calculated for each decade of scheduled timber harvest from the reasonably foreseeable future (2004) through 2054, and for the total harvest of all suitable/available CFL.

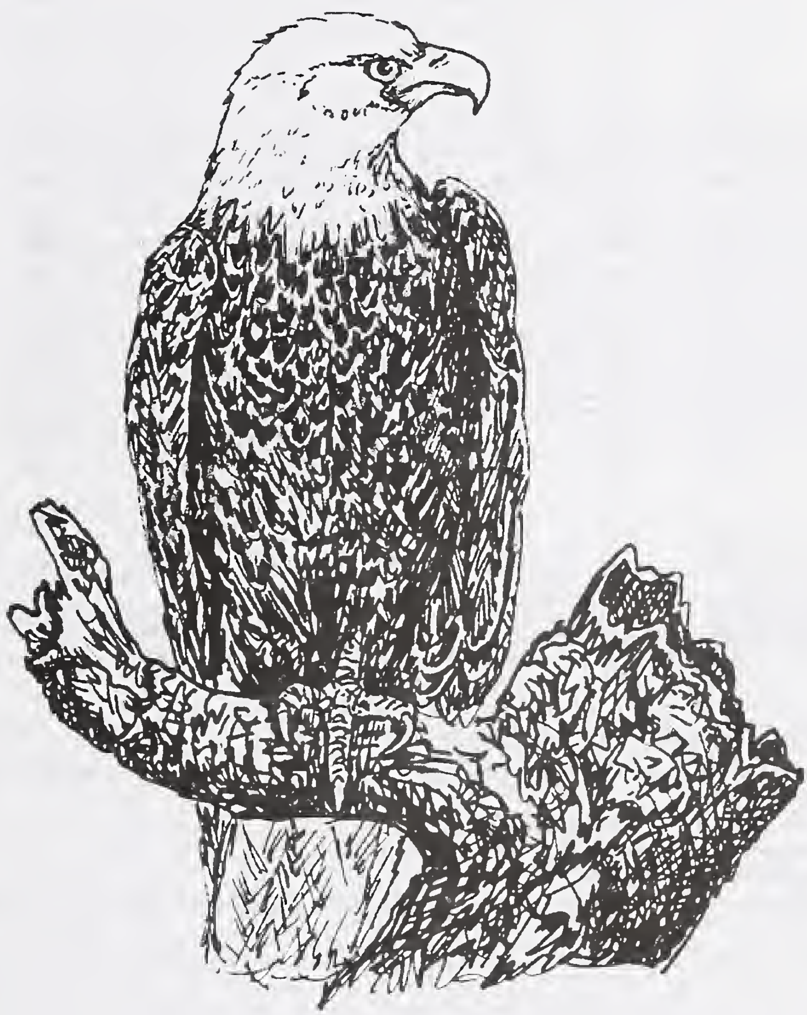


Table 4-54

Cumulative Effects on Project Area MIS Habitat Capabilities for 1954 and by Decade, 1994-2054[1/,2/]

	Sitka Black-tailed Deer	Bald Eagle	Marten	River Otter	Black Bear	Van-couver Canada Goose	Hairy Wood-pecker	Brown Creeper	Red-breasted Sap-sucker	Gray Wolf
Pre-logging 1954	4,216	179	247	51	302	440	2,498	5,840	13,335	15.6
Alternatives										
Alt. 1a 1994	3,256	128	197	42	232	386	1,424	2,635	11,144	11.6
% Change[3/]	-23	-28	-20	-18	-23	-12	-43	-55	-16	-26
Alt. 1 1995	3,200	128	192	42	229	377	1,370	2,548	10,762	11.4
% Change	-24	-28	-22	-18	-24	-14	-45	-56	-19	-27
Alt. F2[4/] 1998	3,089	128	185	42	228	367	1,292	2,474	10,197	11.1
% Change	-27	-28	-25	-18	-25	-17	-48	-58	-24	-29
Decade										
2004	3,040	128	182	42	226	363	1,257	2,441	9,946	11.0
% Change	-28	-28	-26	-18	-25	-18	-50	-58	-25	-30
2014	2,774	128	166	42	211	313	1,104	2,163	8,857	10.0
% Change	-34	-28	-33	-18	-30	-29	-56	-63	-34	-36
2024	2,562	128	153	42	199	274	982	1,943	7,994	9.3
% Change	-39	-28	-38	-18	-34	-38	-61	-67	-40	-41
2034	2,372	128	141	42	189	239	873	1,745	7,217	8.6
% Change	-44	-28	-43	-18	-37	-46	-65	-70	-46	-45
2044	1,915	127	113	41	163	153	609	1,268	5,348	6.9
% Change	-55	-29	-54	-20	-46	-65	-76	-78	-60	-56
2054	1,706	127	100	41	152	115	489	1,050	4,494	6.1
% Change	-60	-29	-60	-20	-50	-74	-80	-82	-66	-61
Total Suitable Harvest	1,446	127	84	41	137	66	339	778	3,429	5.2
% Change	-66	-29	-66	-20	-55	-85	-86	-87	-74	-67

SOURCE: Habitat Capability Models and Forest Service, Ketchikan Area, database.

1/ Numbers reflect effects due to patch size effectiveness (deer, marten, hairy woodpecker, red-breasted sapsucker, brown creeper, and wolf) and road density (black bear).

2/ Numbers by decade represent estimates based on scheduled harvest.

3/ Percent change represents cumulative % change relative to 1954.

4/ Alt. F2 is used to represent all action alternatives.

Cumulative effects on wildlife from timber harvest activities within the North Central Prince of Wales ecological province include cumulative timber harvest within the: (1) Sea Otter Sound Project Area, (2) Central Prince of Wales Project Area (CPOW), (3) Polk Inlet Project Area (4) Control Lake Project Area, (5) Lab Bay Project Area, (6) future Forest Service projects, and (7) harvest on private lands (Figure 4-6).

A small portion of the Polk Inlet Project Area lies within the South Prince of Wales ecological province south of Cholmondeley Sound in VCU 674. This province would support some harvest in future decades; however, because the South Prince of Wales province has a high proportion of LUD's which minimize or exclude timber harvest, this province would not show dramatic declines in habitat capabilities. The TLMP Draft Revision (1991a) provides a maximum potential effects analysis for MIS by ecological province, and is incorporated here by reference.

Timber harvest would also take place on private lands into the future. While it is not known at this time how much private land would be harvested on Prince of Wales Island, it is assumed, given the accelerated rate of harvest currently occurring on private lands on the island (see *Economic and Social Environment)*, that all suitable private timber lands would be harvested by 2054. Private lands have fewer protective restrictions then National Forest System lands and, therefore, declines in habitat capabilities are assumed to be equal to or greater than those occurring on National Forest System land on an acre-for-acre basis. Harvest of private timber lands would not only result in additional losses of habitat capability, they would add to the overall fragmentation and isolation of remaining old-growth habitats (see *Biodiversity* in this chapter for cumulative biodiversity effects).

Mitigation

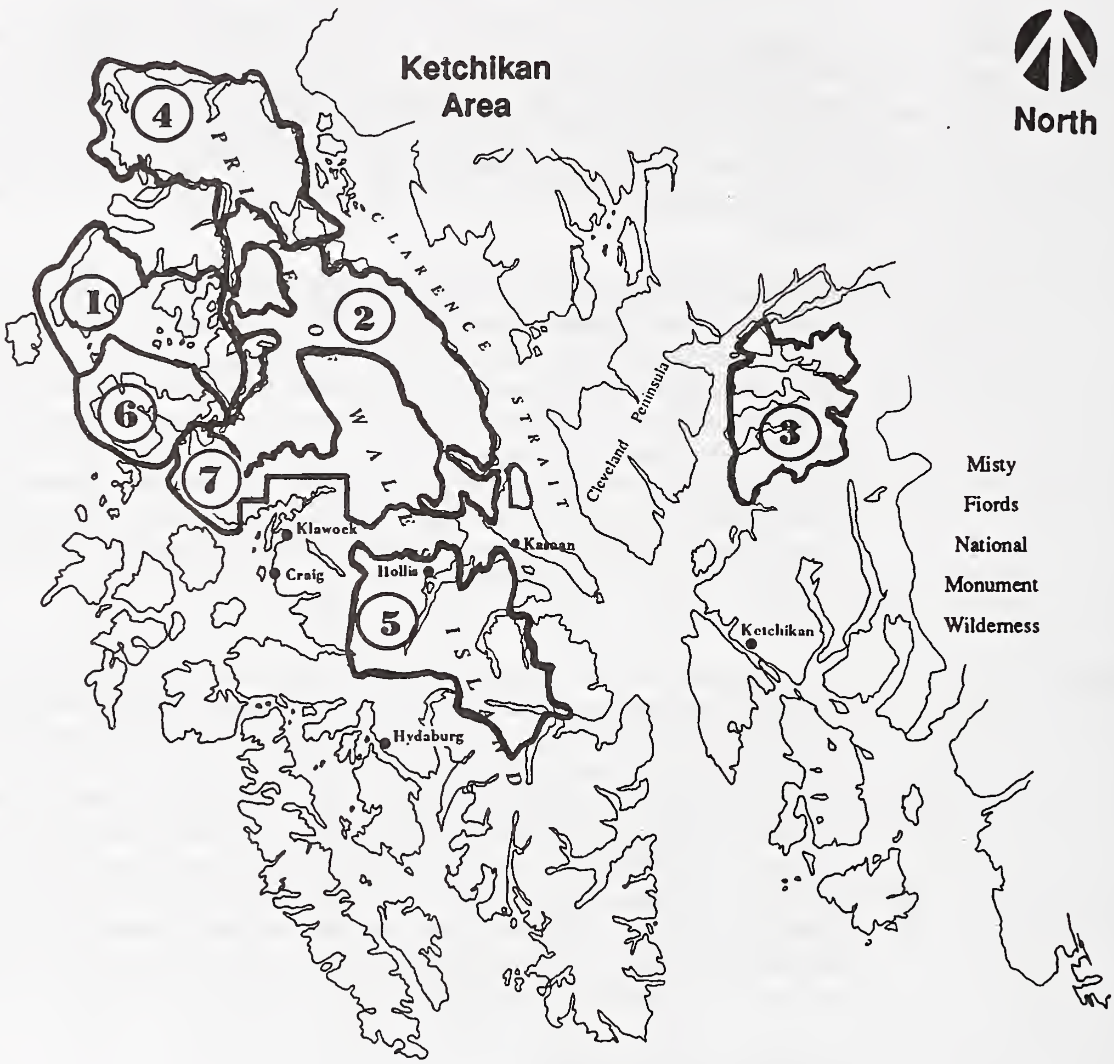
The mitigation measures were developed for the Project Area based on (1) application of forest-wide standards and guidelines, (2) results of studies on wildlife enhancement projects currently underway on Prince of Wales Island (DellaSala et al. 1992), and (3) results of field visits of the Project Area performed by Project team biologists. The Project team was able to locate specific areas where mitigation measures would be most effective and these areas will be emphasized during sale layout. The following measures were designed to eliminate or delay harvest in valuable habitats (Landscape Level Mitigation), to increase structural diversity for wildlife within harvest units (Stand Level Mitigation), and to protect wildlife from direct and indirect consequences of timber harvest associated with construction or harvest operations or human access (Protection Measures). Site-specific mitigation measures are identified by harvest unit in Appendix B and the unit cards.

Landscape Level Mitigation

Implementation of landscape-level mitigation is carried out by the elimination or deferral of harvest within a geographic area. These geographic restrictions are of two types: (1) those implemented prior to alternative selection and (2) those implemented under specific alternatives for wildlife protection. Areas deferred from all alternatives are:

Figure 4-6

Recent and Current Timber Sale EIS's on the Ketchikan Area



List of Recent and Current Timber EIS

No.	EIS	Year
1	N. Sea Otter Sound	1992
2	Central Prince of Wales	1993
3	North Revilla	1993
4	Lab Bay	1993
5	Polk Inlet	1993
6	Heceta	1994
7	Control Lake	1994

- Maybeso Experimental Forest (VCU 610)
- Beaver Creek Drainage (VCU 621)
- Hollis-Klawock Highway (VCU 622)
- Twentymile Creek (VCU 622)
- Hollis (VCU 611)
- Head of Twelvemile Arm (VCU 621)
- Big Creek, Sulzer Portage, west of Cannery Creek (VCU 674)

For a more detailed description of these geographic areas and the reasons for their deferral see Mitigation in Chapter 2.

Forest management goals for wildlife direct that as much contiguous old-growth habitat be maintained as possible to ensure the maintenance of viable populations and that adverse impacts from human activities be minimized through road and facility management. Under the guidelines of this directive, specific geographic areas were deferred from timber harvest consideration under some alternatives. These areas were selected for various combinations of reasons, all of which provide benefits to MIS and the complex of old-growth obligate and associate species they represent. Geographic areas considered for wildlife protection are presented below.

Indian Creek

This area was identified by ADF&G as having high wildlife, subsistence, and research concerns. The upper end of Indian Creek has high potential for goose nesting and is a favorite deer-hunting area. Although the area is being partially harvested under the 1989-94 EIS, protection of the remaining habitat was considered a priority. Indian Creek is also adjacent to a contiguous block of old-growth habitat (Lower Indian Creek) owned by the State of Alaska. This area is in VCU 622, and includes Units 622-247, 622-249, 622-254, 622-255, 622-257, 622-264, 622-269, 622-265, 622-266, 622-271, 622-272, 622-276. This area would be entered under Alternatives F2, 3, and 4.

West Side of Twelvemile Arm

This area offers a large unroaded and relatively unfragmented block of contiguous old-growth habitat at low elevation. It connects with the visual and recreation area at the head of the inlet and with a state-owned old-growth block on Lower Indian Creek. This area contains one of the units where marbled murrelet eggshell fragments were found. It is located in VCU 621, and includes Units 621-246, 621-248, 621-250, 621-251, 621-252, 621-254, 621-255, 621-258, 621-268. This area would be entered under Alternatives 3 and 4 and in the north end under Alternative F2.

Northern Portion of the East Side of Twelvemile Inlet

This area is a large unroaded and relatively unfragmented block of contiguous old-growth habitat with high-volume, low-elevation forests. The area is immediately adjacent to goose-nesting habitat, and contains a confirmed location of a marbled murrelet nest site. It is located in VCU 621 and 611, and includes Units 621-299, 621-311, 621-310, 621-308, 621-307, 621-291, 621-293, 611-201, 611-204, 611-207, 611-214, 611-215. It would be entered only under Alternative 3.

Upper Old Franks Lakes and Kina Creek

This area represents two interconnected blocks of old-growth habitat, one surrounding upper Old Franks Lakes, and the other at the upper end of the Kina Creek Drainage. The lower sections of these drainages are under private ownership and have already been harvested. The

area contains a unit in which marbled murrelet eggshell fragments were found, as well as two sightings of a goshawks. It is one of the few unharvested interior valleys left in the Project Area, and is heavily used by MIS. It is located in VCU's 612 and 613, and includes Units 612-202, 612-204, 612-207, 612-211, 612-213, 613-202, 613-205, 613-206, 613-208, 613-218, 613-228, 613-219. This area would be entered under Alternatives 3 and 4.

Goose Bay

This is an unroaded block of high-volume, low- to mid-elevation old growth which is adjacent to and contiguous with the Old Tom Research Natural Area. There is a significant amount of high-volume habitat at lower elevations, and it has a relatively large amount of saltwater shoreline. Maintenance of this block increases the effectiveness of the Old Tom Research Natural Area as a core wildlife habitat area. It is located in VCU 619, and contains Units 619-248, 619-250, 619-251, and 619-261. This area would not be entered under Alternatives 3, 4, and F5; only one unit would be harvested under Alternative F2.

West Side of McKenzie Inlet

This area will be entered under the 1989-94 EIS and will undergo some fragmentation. It contains large areas of high-volume old growth which are immediately adjacent to the Old Tom Research Natural Area. As with the Goose Bay area, the west side of McKenzie Inlet increases the effectiveness of the Old Tom Research Natural Area as a core wildlife habitat area. This block, in combination with the Research Natural Area, buffers a large area of goose-nesting habitat and provides habitat for other MIS using this area. It also provides a large amount of high-volume forest at low elevation. This block of habitat is important in linking the Old Tom Research Natural Area with protective LUD's in the South Prince of Wales ecological province. It is located in VCU 619, and contains Units 619-209, 619-233, 619-235, 619-238. This area would not be entered under Alternatives F2 and 3; would be entered by one unit at the north end under Alternative F5; and would be entered. more extensively under Alternative 4.

East Side of McKenzie Inlet

This block of old-growth habitat represents a large unroaded block of low-mid volume old-growth habitat. The south end of the inlet will have some harvest under the 1989-94 EIS, but the northern end retains a large section of interior habitat. This block is located in VCU 618, and contains Units 618-203, 618-205, 618-216, and 618-221, which are all prescribed for helicopter logging. This area would be entered only under Alternative F5.

Sunny Creek

This area is a large, unroaded, unfragmented, interior valley block of old-growth habitat. It and Cannery Creek, Big Creek, and Sulzer Portage, are the only interior valleys that contain such high quality deer winter range and MIS habitat. The area is dominated by high-volume old growth at relatively low elevation. It is also a critical link in the corridor of interior habitat between the Old Tom Research Natural Area and the South Prince of Wales ecological province. The area is excellent habitat for black bear, and the habitats around Sunny Cove support concentrations of Vancouver Canada goose, other waterfowl, and sandhill cranes. It is located in VCU 675, and contains Units 675-206, 675-208, 675-209, 675-210, 675-226, 675-228, 675-235, 675-237, 675-241, 675-242, 675-243. It would be entered only under Alternative 3.

Cannery Creek

This area represents a large block of contiguous high-volume, low-elevation old growth. It, along with Sunny Creek, Big Creek, and Sulzer Portage, are the only interior valleys which contain such high-quality deer winter range and MIS habitat. This block of habitat was found

to be used by an existing pack of wolves, and areas immediately adjacent were being used by geese. This area also provides the connectivity between the Old Tom Research Natural Area and the South Prince of Wales ecological province. The lower section of Big Creek has already been harvested, and Sulzer Portage and much of the remaining habitat in Big Creek has been selected and is to be conveyed and will likely be harvested in the foreseeable future. Future harvest and cumulative effects increase the value of this block of old growth as a high priority wildlife area. It is located in VCU 674, and contains Units 674-213, 674-253, and 674-265. It would be entered under Alternative 4 only.

Stand Level Mitigation

Stand diversity levels within harvest units could be enhanced through the application of specific silvicultural measures designed to provide structural diversity within regenerating stands. These include clearcutting with reserve trees (using one of the four types of clearcuts defined in Chapter 3, *Vegetation and Timber Resources*) or partial cutting. The primary objective of this mitigation strategy would be to provide habitat for species that utilize specific stand attributes that are characteristic of old-growth forests (e.g., large-diameter snags and structural diversity).

By including old-growth "islands" or reserve trees within harvest units and partial cutting, within-stand diversity levels could be better maintained within regenerating units. Old-growth islands should be comprised of suitable reserve trees such as large-diameter snags and live trees. Where possible, the size and density of reserve trees should be dictated by standards and guidelines for cavity-nesting species. For instance, to maintain 50 percent of the maximum populations of hairy woodpeckers in an area, approximately 336 soft and hard snags that are greater than or equal to 15 inches dbh and greater than or equal to 10 feet in height would need to be maintained per 100 acres. Snags could be distributed in clumps away from guylines and in protected draws to minimize blowdown effects and conflicts with safety standards (Forest Service 1993). Leaving live trees, as well as snags, ensures adequate snag recruitment throughout the length of the rotation, provides additional snow interception within regenerating units, provides greater structural diversity within the second-growth stand, and provides refugia for important understory species which can recolonize the second-growth stand when it is old enough. To ensure that nesting habitat, structural diversity, and plant refugia are well distributed in the second-growth stand, no location in a harvest unit should be more than 400 feet from old-growth trees, wherever possible. Leaving nonmerchantable trees and safe snags along the edges or throughout the harvest unit is a minimum recommendation identified for all harvest units as a means of maintaining snag densities and increasing structure in second-growth stands.

Mitigation Measures W1 through W5 incorporate these strategies in all harvest units. Mitigation Measure W1 (corresponding to clearcut Type D) would provide for no-cut old-growth islands or fingers of timber. Mitigation Measure W2 would provide for partial cutting of the entire harvest unit. Mitigation Measure W3 (corresponding to clearcut Type C) would leave nonmerchantable trees and safe snags over the entire unit using helicopter yarding. Mitigation Measure W4 (corresponding to clearcut Type B) would leave a specified number and size of reserve trees, including snags and live tree replacements, in a 50-to-100-foot border along harvest unit edges and setting boundaries. The minimum stand level mitigation for all harvest units would be Mitigation Measure W5 (corresponding to clearcut Type A). This measure would be similar to Mitigation Measure W4, except only nonmerchantable trees and safe snags would be left along setting borders.

In Southeast Alaska, precommercial thinning is the preferred silvicultural treatment in regenerated stands and has also been widely used to enhance young-growth habitat for wildlife (see Chapter 3, *Vegetation and Timber Resources*). However, since this technique results in uniform tree growth, it may not achieve the desired effect of enhancing within-stand diversity levels within regenerating stands. Consequently, the specific benefits to wildlife are the subject of recent debate and studies are currently underway to assess the effectiveness of this enhancement program (DellaSala et al. 1992). Other methods using variable tree-spacing intervals for precommercial thinning are also currently being tested on Prince of Wales Island (Mitigation Measure W6). Although the benefits of this technique to wildlife have not yet been field verified, variable tree spacing could be combined with old-growth islands on an experimental basis to determine if these techniques are effective in providing additional structure within regenerating units. Such techniques would require follow-up monitoring to determine their effectiveness and the need for further design modifications.

All of the above measures would be used as wildlife mitigation in the Polk Inlet Project. Specific harvest units for which these measures are prescribed are listed in Appendix B. Although the above recommendations would likely increase stand-level diversity in regenerating forests, they are not intended to compensate for landscape diversity losses. Furthermore, small old-growth islands may only produce a mitigation effect when the total area harvested is not significantly increased to account for reductions in volume associated with these islands. Increasing the total area harvested to compensate for old-growth islands could increase overall fragmentation in the Project Area and further reduce landscape diversity levels. The measures discussed above have been designed to increase structural diversity while minimizing timber volume losses within harvest units.

Protection Measures

The following additional mitigation measures are proposed to provide protection for wildlife from human disturbance both during and after harvest operations.

1. Roads into valuable wildlife areas would be managed to discourage or prohibit motorized use following harvest activities (Mitigation Measure W10). A list of road systems on which post-harvest use would be discouraged or prohibited for wildlife protection is presented below. For a more detailed presentation of access management, see *Transportation and Facilities.*

Road System	Closure Class	Closure Strategy
Indian Creek	Prohibited	Wildlife Protection
Upper Old Franks	Eliminated	Wildlife Protection
Sunny Creek	Discouraged	Wildlife Protection
Cannery Creek	Discouraged	Wildlife Protection
East Twelvemile Inlet	Discouraged	Wildlife Protection
Cabin Creek	Discouraged	Wildlife Protection
Coal Bay	Discouraged	Wildlife Protection
West McKenzie Inlet	Discouraged	Wildlife Protection
East Polk Inlet/Old Tom	Discouraged/Seasonally closed	Wildlife Protection

2. Restrict harvest unit and road construction activities in areas and during time periods when Vancouver Canada geese nesting or trumpeter swan wintering might be disturbed (Mitigation Measure W11).

3. The timing of helicopter logging and the helicopter flight paths and blasting for road construction would be restricted near bald eagle nest sites when these sites are occupied (Mitigation Measure W8).

Monitoring

A variety of forest-wide monitoring activities are proposed in the TLMP Draft Revision (1991a), that serve to verify that standards and guidelines affecting wildlife have been implemented and that they are being effective. Monitoring activities directed specifically at wildlife habitat include: field monitoring to verify that wildlife habitat standards and guidelines are being implemented and are effective (Wildlife Habitat Monitoring Items 1 and 2); monitoring to determine if wildlife enhancement projects are producing anticipated outputs (Wildlife Habitat Monitoring Item 3); and monitoring to validate the wildlife habitat capability models for MIS (Wildlife Habitat Monitoring Item 4).

Project-specific monitoring has been identified to monitor the implementation and effectiveness of the four types of clearcutting with reserve trees prescribed for Polk Inlet Project units as an ecosystem management measure and to monitor the effectiveness of nest-site buffers for marbled murrelets. This monitoring will include the preparation of a brief report by wildlife and visual resource specialists, based on ground observations and comparisons with unit cards and silvicultural prescriptions for 20 percent of the units (see Chapter 2).

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Threatened, Endangered, and Sensitive Species

Key Terms

Category 3 Candidate—species that are now considered to be more abundant and/or widespread than previously thought.
Category 2 Candidate—a species or group of species being considered by the U.S. Fish and Wildlife Service for listing as endangered or threatened, but for which conclusive data is lacking on its biological vulnerability and degree of threat.
Endangered—a species in danger of extinction throughout all or a significant portion of its range.
Haul-out—area of large, smooth, exposed rocks used by seals and sea lions for resting and pupping.
Patch—an assemblage of similar vegetation - in this document the focus is on old-growth forests of greater than 8,000 board feet/acre, with only small inclusions of other habitats.
Sensitive—species (identified by the Regional Forester) whose population viability is of concern on National Forests within the region, and which may need special management to prevent their being placed on State and Federal threatened and endangered species lists.
Threatened—a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Introduction

This analysis of the environmental consequences of the action alternatives on threatened, endangered, and sensitive species considers the direct, indirect, and cumulative effects of timber harvest in the Project Area. Direct and indirect effects are projected to 1997, the anticipated end of implementation of the Polk Inlet Project; to 2004, which includes the reasonably foreseeable future and the end of the KPC Long-term Sale Contract; and to 2054, to show the cumulative impacts of harvesting all the suitable/available CFL through the first rotation and to show the cumulative impacts of past and proposed timber harvest.

A full biological assessment and biological evaluation has been prepared for all threatened, endangered, sensitive, and candidate species and is included as Appendix J in Volume III of this Final EIS.

Plants

No Federal candidate species or Region 10 sensitive species were found during field surveys. Therefore, no significant effects on these species are anticipated (see Appendix J for a more detailed evaluation).

Two species of concern were located during the surveys. Both species are listed by The Nature Conservancy as G5 (demonstrably secure globally) and S1 (critically imperiled in Alaska because of extreme rarity or because of some factor(s) making it very vulnerable to extirpation from the state [Forest Service 1991b]).

A small population of *Listera convalarioides* (approximately 30 plants) was found in a yellow cedar/western hemlock forest in a moist area along the edge of a stream, north of Harvest Unit 620-349. The population occurred in an area of approximately 10 square yards and is apparently healthy. This area is not currently proposed for timber harvest and is roughly 1,000 feet away from Harvest Unit 620-349. This is far enough that the local microclimate would not be affected.

A small population (200 or more plants) of *Vaccinium oxycoccus* was found growing on muskeg adjacent to a small, unnamed Class I lake immediately north of harvest Unit 622-271. The population covered an area of approximately 100 square yards and was apparently healthy and contained within the lake's no-harvest buffer. Consequently, none of the timber management alternatives would significantly affect sensitive plant populations, and the population site microclimate should not affected.

Humpback Whale

Because the humpback whale is primarily affected by changes in the marine environment, the primary effects from timber management operations in the Project Area would be limited to disturbance of whales by human activities at LTF's and their associated camps, the movement of log rafts from LTF's to mills, and associated boating and aircraft activities including log raft towing and recreational boating by timber workers (Forest Service 1991). In addition, humpback whales may become entangled in LTF cables; the one known incidence of whale entanglement in LTF cables occurred in the Tongass National Forest (Forest Service 1991).

Timber harvest operations in the Project Area under each of the timber management alternatives are not expected to adversely affect whales that potentially migrate through the Polk Inlet area.

Steller Sea Lion

The Steller sea lion is primarily associated with the marine environment; therefore, potential impacts from timber management operations in the Project Area are limited to the LTF's and their associated camps, and log shipments from LTF's to their destination. Mitigation measures should reduce disturbance associated with logging operations in the Project Area to acceptable levels under each of the timber management alternatives. Consequently, no alternative is likely to adversely affect sea lions.

Steller sea lion

American Peregrine Falcon

The primary effect under the action alternatives to peregrine falcons potentially migrating through the Project Area include localized disturbances of prey species near shoreline areas, particularly waterfowl and shorebirds. Forest-wide standards and guidelines protect seabird rookeries and waterfowl concentration areas that occur on the Tongass National Forest (Forest Service 1991). In addition, the application of 500-foot buffer zones around beach fringe and 1,000-foot buffers around estuaries should minimize the effect on prey species that occupy shoreline areas under each of the timber management alternatives. Consequently, none of the timber management alternatives is likely to affect peregrine falcons should they migrate through the area.

Eskimo Curlew

None of the timber management alternatives is likely to affect Eskimo curlews because: (1) this species has not been sighted in Alaska since 1986; (2) the analysis area is outside the normal migratory path of the Eskimo curlew; and (3) coastal areas that are most likely to be used by migratory curlews are protected by 500- to 1,000-foot buffers, as specified in the forest-wide standards and guidelines.

Aleutian Canada Goose

None of the timber management alternatives are likely to affect the Aleutian Canada goose because: (1) with the exception of an occasional migrant that wanders off its traditional migration route, it is unlikely that this species occurs in the Project Area (personal communication, J. Lindell, Endangered Species Coordinator, USFWS, Anchorage, September 18, 1992); and (2) coastal areas most likely to support migrating geese and such areas are protected by 500- to 1,000-foot no-cut buffers.

Marbled Murrelet

The distribution of marbled murrelets in the Polk Inlet Project Area could not be determined from the general walk-through surveys of proposed harvest units. Therefore, the specific impacts of the action alternatives on individual murrelets potentially nesting in the entire Project Area are unknown. Given that concentrations of murrelets were observed near Twelvemile and Polk Inlets, Cholmondeley Sound, and Clarence Straits and other information presented in Chapter 3, it is highly likely that murrelets are nesting throughout the Project Area, especially near coastal feeding areas. Consequently, the effects on murrelets may be greater than discussed below because of the potential for undiscovered nest sites existing in harvest units, and project-wide reductions in old growth. However, on a project-wide basis, overall effects should be on the order of 4 to 6 percent based on the amount of old-growth habitat loss (see Appendix J).

Murrelet eggshell fragments were found in three proposed harvest units during site visits by field verification teams: Unit 299 on the east side of Twelvemile Arm (VCU 621); Unit 254 on the west side of Twelvemile Arm (VCU 621); and, Unit 202 on the east side of the Old Franks Drainage (VCU 613). The primary effects on murrelets under the action alternatives include: (1) direct loss of old-growth nesting habitat, and (2) indirect losses associated with fragmentation of relatively contiguous old-growth areas. The extent of these impacts were evaluated for VCU's 613 and 621 where murrelet egg shell fragments were found.

Harvest of suitable murrelet habitat in VCU 613 would range from a 10 to 12 percent decline over existing conditions for Alternatives F2, 4, and F5 to a 17 percent decline for Alternative 3 (Table 4-55). In addition, suitable habitat in VCU 621 would decline from 6 to 7 percent for Alternatives F2 and F5 to 14 percent, for Alternative 3.

Table 4-55

Acres of Old Growth Harvested in VCU's with Known Northern Goshawk or Marbled Murrelet Activity, by Alternative

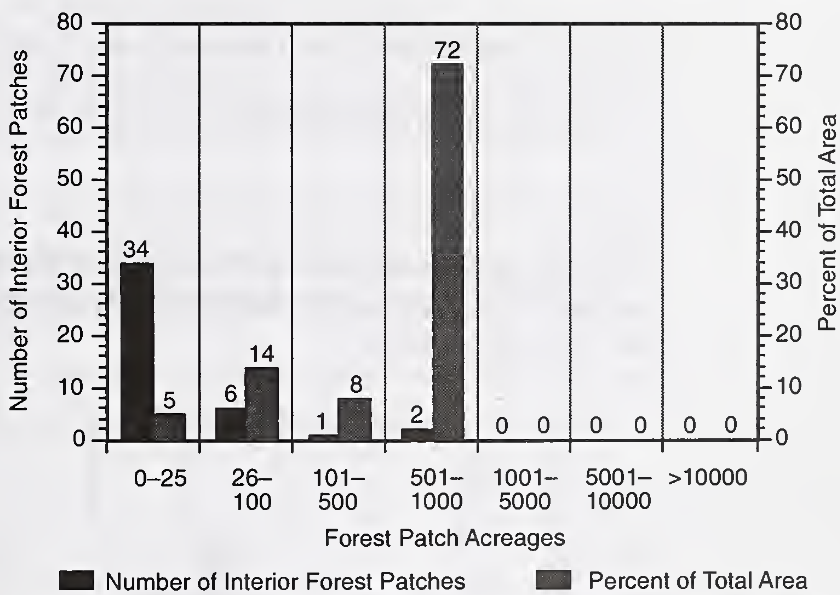
	Volume Class	1995 Existing Conditions1/	Action Alternatives F2	3	4	F5
VCU 613 1/3/	4	3,386	421 (12)2/	510 (15)	362 (11)	369 (11)
	5	1,212	125 (10)	236 (20)	58 (5)	123 (10)
	6	1,073	104 (10)	216 (20)	103 (10)	104 (10)
	7	382	83 (22)	83 (22)	83 (22)	83 (22)
	Total	6,053	733 (12)	1,045 (17)	606 (10)	679 (11)
VCU 621 3/	4	3,704	272 (7)	586 (16)	447 (12)	258 (7)
	5	2,713	211 (8)	336 (12)	289 (11)	203 (7)
	6	1,062	41 (4)	135 (13)	41 (4)	18 (2)
	7	192	0 (0)	17 (9)	0 (0)	0 (0)
	Total	7,671	524 (7)	1,074 (14)	777 (10)	479 (6)

SOURCE: Forest Service, Ketchikan Area, database.
1/ Confirmed goshawk presence.
2/ Percent reductions for each alternative are indicated parenthetically.
3/ Confirmed marbled murrelet presence.

In addition to the reductions in timber Volume Classes 4 to 7 discussed above, the timber management alternatives would result in fragmentation of large blocks of interior forest habitat. Harvest above existing conditions in VCU 613 would cause a shift of interior forest habitat in the 501- to 1,000-acre patch size class to smaller forest patches (Figures 4-7 to 4-11). Notably, the amount of interior forest habitat in this patch size would decline to zero under timber management Alternative 3 (Figure 4-9). In addition, VCU 621 would experience similar declines in interior forest habitat within the 501- to 1,000-acre size class under each of the timber management alternatives (Figures 4-12 to 4-16). Interior forest habitat in this patch size class would also decline to zero under timber management Alternative 3. Although interior habitat would still be present in smaller patch size classes in both VCU's, these size classes may be less suitable for nesting if predation effects increase in relation to patch fragmentation. These effects are probably not restricted to these two VCU's, given the high number of murrelets observed feeding in coastal areas within proximity of the Project Area.

Figure 4-7

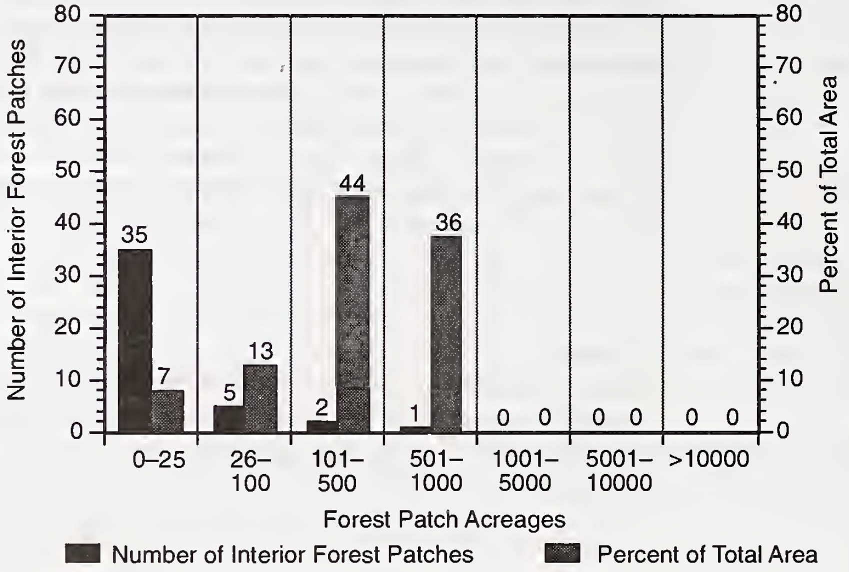
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Existing Conditions for VCU 613—1995 (Alternative 1)[1/]



SOURCE: Forest Service, Ketchikan Area, database.
1/ Both marbled murrelets and northern goshawks were detected in this VCU.

Figure 4-8

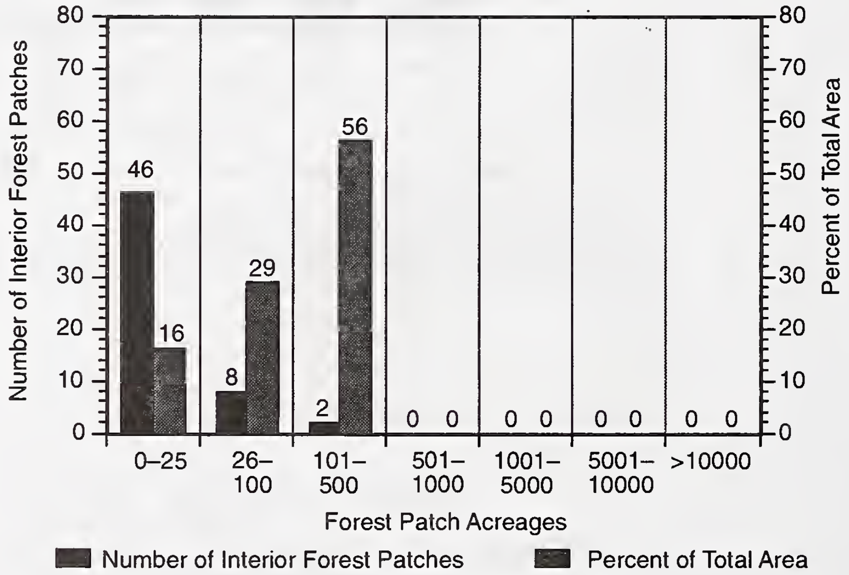
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative F2 for VCU 613—1998 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Both marbled murrelets and northern goshawks were detected in this VCU.

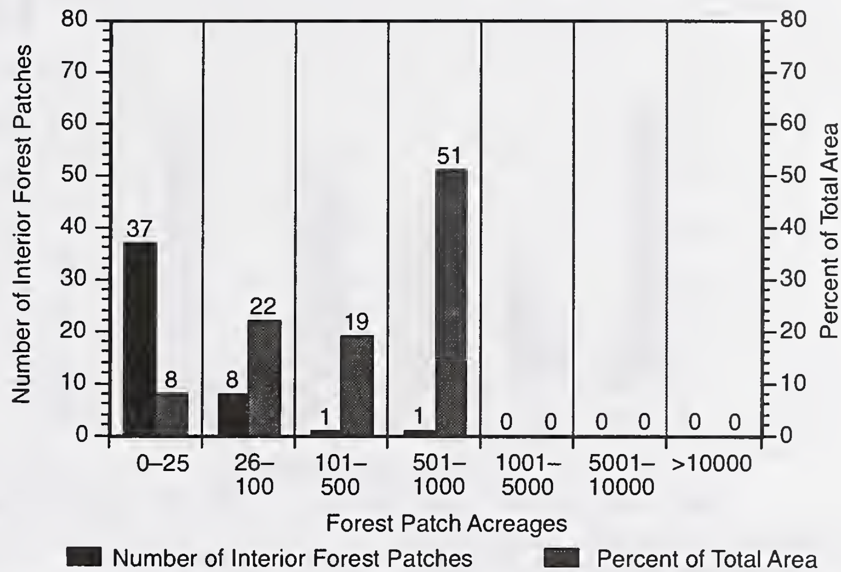
Figure 4-9

Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative 3 for VCU 613—1998 1/



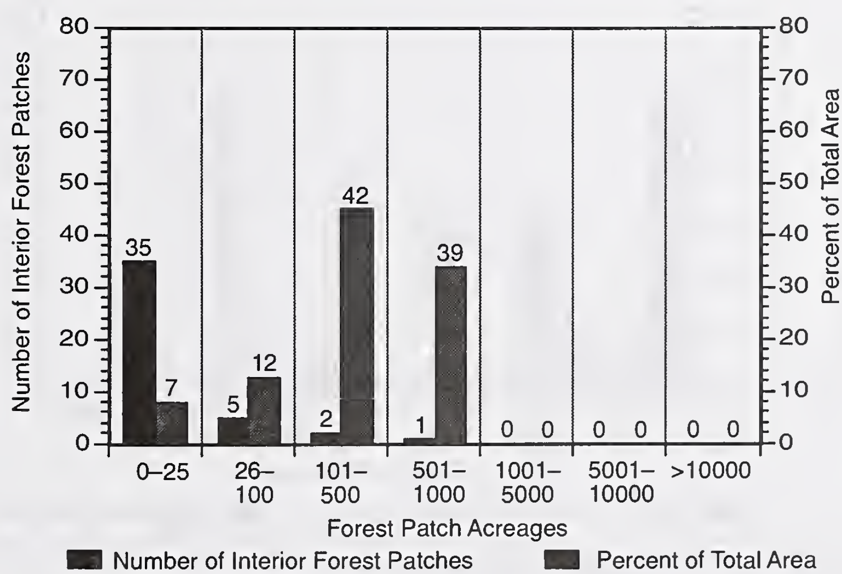
SOURCE: Forest Service, Ketchikan Area, database.
1/ Both marbled murrelets and northern goshawks were detected in this VCU.

Figure 4-10
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative 4 for VCU 613—1998 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Both marbled murrelets and northern goshawks were detected in this VCU.

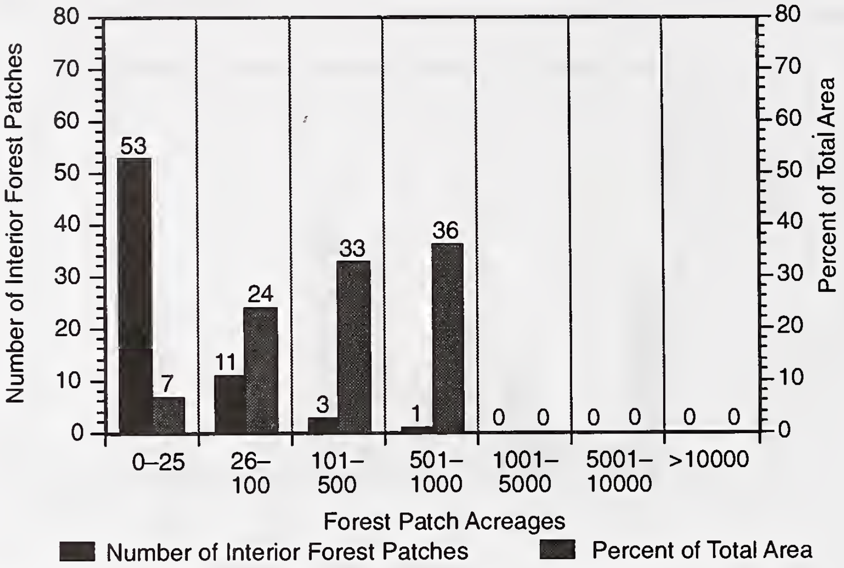
Figure 4-11
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative F5 for VCU 613—1998 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Both marbled murrelets and northern goshawks were detected in this VCU.

Figure 4-12

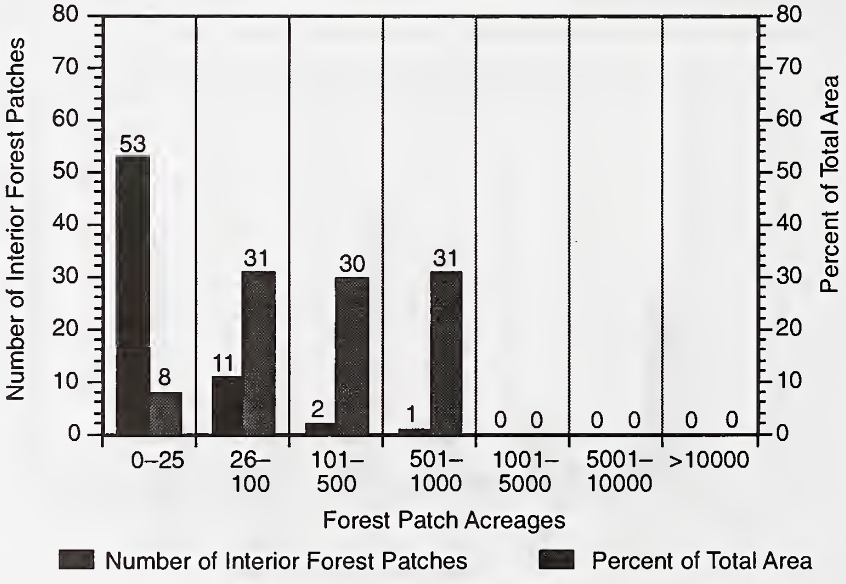
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative 1 for VCU 621—1995 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Marbled murrelets were detected in this VCU.

Figure 4-13

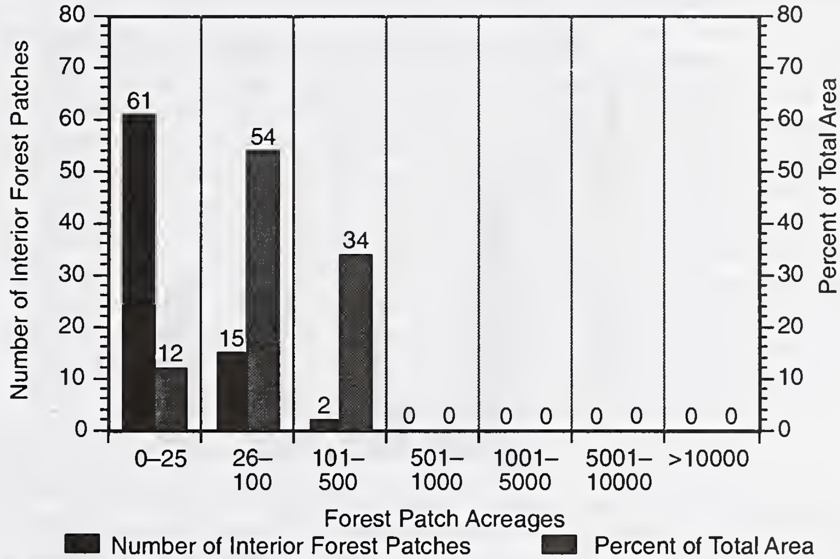
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative F2 for VCU 621—1998 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Marbled murrelets were detected in this VCU.

Figure 4-14

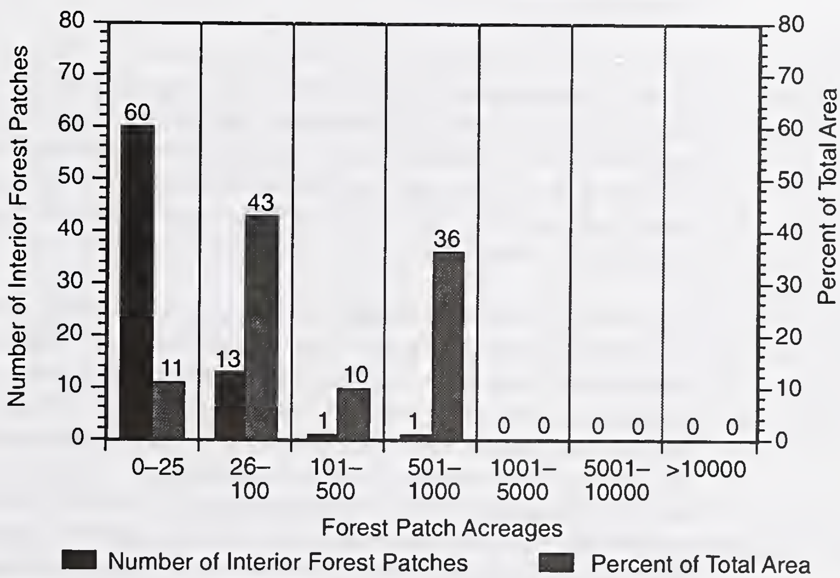
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative 3 for VCU 621—1998 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Marbled murrelets were detected in this VCU.

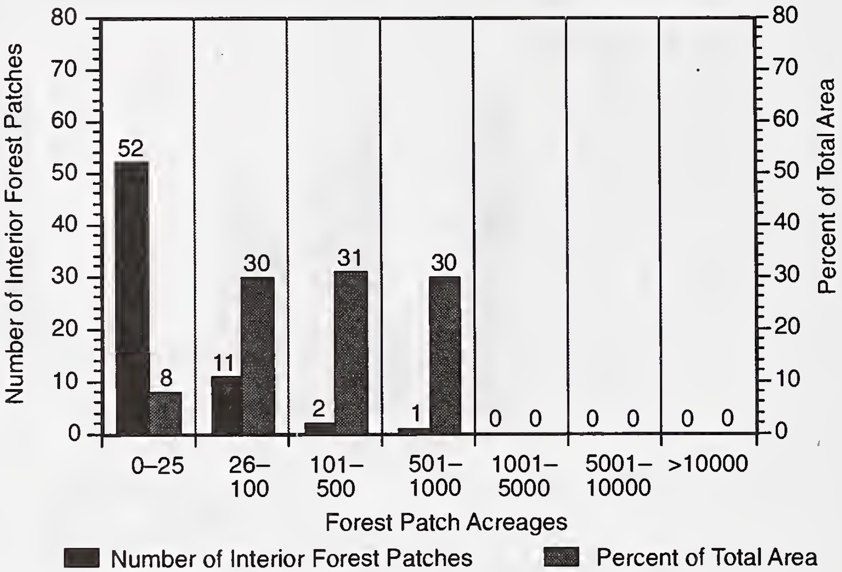
Figure 4-15

Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative 4 for VCU 621—1998 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Marbled murrelets were detected in this VCU.

Figure 4-16
Number of Interior Forest Patches and Percent of Total Project Area Interior Forest Under Alternative F5 for VCU 621—1998 1/



SOURCE: Forest Service, Ketchikan Area, database.
1/ Marbled murrelets were detected in this VCU.

The Forest Service is evaluating the need for protective buffers for marbled murrelet nest sites in proposed timber sale areas. Interim guidelines specify the inclusion of a 25- to 30-acre buffer zone surrounding murrelet nest trees within which timber harvest is prohibited. This buffer zone will be used for the two unconfirmed and one confirmed nest sites in the Project Area.

Northern Goshawk

None of the alternatives proposes timber harvest of known nest areas or designated post fledging areas and no nest sites have yet been found in the Polk Inlet Project Area despite extensive surveys. Goshawks have been seen in the Old Franks drainage during the breeding season, but the extent of overlap between this goshawk home range and the Polk Inlet harvest units is unknown. Alternatives F2 and F5 would result in the least amount of harvest in this drainage and its vicinity.

A draft environmental assessment on Interim Habitat Management Guidelines for Maintaining Well-Distributed Viable Wildlife Populations within the Tongass National Forest was prepared by the Forest Service in the fall of 1994. These guidelines include an extensive Habitat Conservation Area (HCA) strategy consisting of large and medium HCA's and a protection strategy for goshawk home ranges associated with all identified nests. Alternatives F2 and F5 fully comply with these Interim Habitat Guidelines. These two alternatives are associated with Project-specific old-growth retention strategies developed for the Polk Inlet Project. However, because the Polk Inlet Project proposes additional harvest in old growth, including the Old Franks drainage where goshawks have actually been observed, the Project may affect the Queen Charlotte goshawk. Because of the old-growth conservation strategies incorporated

into Alternatives F2 and F5, significant effects are not expected under these alternatives. Alternative 3 may significantly affect goshawks, because of the extent of harvest in the Old Franks drainage. Alternative 4 would result in greater effects than Alternatives F2 and F5 due to the associated greater amount of entry into relatively unfragmented areas.

Direct reductions in suitable goshawk nesting habitat (i.e., Volume Classes 4 through 7) in VCU 613 where goshawks have been observed during the breeding season, would range from 10 to 12 percent of existing conditions for Alternatives F2, 4, and F5 to 17 percent for Alternative 3 (Table 4-55). In addition, the timber management alternatives would result in fragmentation of large blocks of forest interior habitat that could provide nesting habitat for goshawks in this VCU. As discussed above for murrelets, there is currently no forest interior habitat within VCU 613 larger than 1,000 acres (Figure 4-16). However, a relatively high percentage of forest interior habitat occurs in the 501- to 1,000-acre patch size within this VCU. Additional harvest in VCU 613 would result in a shift of forest interior habitat from this patch size class to smaller forest patches (Figures 4-8 to 4-16). Notably, the amount of forest interior habitat in this patch size would decline to zero under Alternative 3 (Figure 4-8). The overall effect of timber management alternatives on goshawks would be (1) direct loss of old growth because of timber harvest, (2) a shift in large patches of forest interior habitat to smaller interior patches. Any goshawk nest found prior to harvest will be protected utilizing the goshawk management guidelines in effect at that time.

Spotted Frog

The distribution of the spotted frog in the Project Area could not be determined from the general walk-through of proposed harvest units. However, based on habitat requirements, spotted frogs are primarily limited to permanent bodies of water (Hodge 1976, Broderson 1982, Nussbaum et al. 1983). Forest-wide standards and guidelines maintain a 100-foot buffer around Class I and II streams, a 500-foot buffer around beach fringe, and a 1,000-foot buffer around estuaries. Therefore, impacts to frogs potentially breeding within riparian and stream areas should be minimized under each of the timber management alternatives. However, some incidental impacts would occur to forested muskegs and small ponds within harvest units (less than 1/10 acre). In addition, impacts to frogs moving overland during the spring and summer could not be assessed because of the lack of data on frog densities, distributions, movements and habitat use during such movements.

Trumpeter Swan

Approximately 12,000 acres of forest muskeg (Table 3-28), 587 acres of nonforest muskeg (Table 3-28), and 1,600 acres of inland mesic habitat (Table 3-28) occur in the Project Area. Of these habitat types, inland mesic habitat and nonforest muskeg provide the most suitable wintering locations for swans in the Project Area. Both inland mesic habitats and nonforest muskegs have no timber value and consequently no direct harvest is planned within these types. In addition, these habitat types are protected by 500-foot buffers that should provide adequate visual screens from logging operations. Other habitat types capable of supporting wintering swans, such as estuaries, intertidal lakes, and streams, would also be protected by buffers. The forest muskegs in the Project Area probably provide limited wintering habitat for swans because of the lack of aquatic habitat. Therefore, timber management alternatives are not likely to affect swans that may be wintering in the Project Area. In addition, TLMP standards and guidelines (1991a) prevent harvesting of units within 1/2 mile of wintering swan locations during November through March.

Other Candidate or Sensitive Species

The effects of the Project on the eight remaining candidate/sensitive species are briefly summarized here. These species are evaluated in detail in the biological assessment and biological evaluation for the Project (Appendix J).

Project effects on the Alexander Archipelago wolf are described under Management Indicator Species in the Wildlife section. Effects on the Prince of Wales flying squirrel are expected to occur, but are not expected to be significant. Similarly, minor effects on the olive-sided flycatcher could occur, although these are likely to be positive.

No Project effects are predicted for the Arctic and Peale's peregrine falcons, osprey, Kittlitz's murrelet, and the harlequin duck.

Timber harvest is likely to negatively affect Franklin's grouse habitat. Habitat impacts are likely to be on the same order as the impacts on the MIS birds. Assuming that habitat capability for Franklin's grouse parallels the habitat capabilities for the red-breasted sapsucker, the action alternatives would produce reductions of 4 to 6 percent from existing conditions.

Cumulative Effects

Cumulative effects are the result of changes in the environment caused by the interaction of natural ecosystem processes and the effects of multiple management actions. Wildlife habitat and associated populations of threatened, endangered, and sensitive species may be influenced by the result of multiple entries to remove timber within the Project Area, and the combined or synergistic effects of habitat loss in adjacent areas. The humpback whale, Steller sea lion, American peregrine falcon, Eskimo curlew, Aleutian Canada goose, spotted frog, and trumpeter swan are unlikely to experience long-term cumulative effects because of their limited use of the area or because their habitats are unaffected or minimally unaffected by timber harvest. The populations of northern goshawk and marbled murrelet, however, may experience significant long-term cumulative effects.

Cumulative harvest acreages and distribution are discussed in the *Timber* and *Wildlife* cumulative effects sections of this chapter. As noted in those sections, about the year 2054, TLMP's scheduled harvest shifts from old growth to second growth, and all suitable/available and scheduled stands previously harvested would be maintained as second growth. Under the desired future condition, the remaining old-growth forest in the Project Area would be confined to isolated blocks located within Old Tom Research Natural Area and Maybeso Experimental Forest, and in linear patches of old-growth forest maintained within mandated and prescribed buffers and in small patches of unsuitable CFL. Although linear patches would likely function as linkages to other forest blocks and as travel corridors for some wildlife, it is doubtful that they would provide adequate habitat for northern goshawks which require large blocks of intact old-growth forest or sufficient nesting habitat to maintain current population levels of marbled murrelets.

The northern goshawk would be particularly susceptible to long-term cumulative effects because of its low population in Southeast Alaska and its primary dependence on the characteristics of old-growth habitat for all aspects of its life cycle. The reduction in unfragmented old-growth habitat for foraging and nesting under long-term harvest conditions within the Polk Inlet Project Area increases the possibility of adverse effects on the northern goshawk.

In contrast to the northern goshawk, the marbled murrelet has a large population in Southeast Alaska, depends on the ocean environment for food and on old-growth forests primarily for nesting. This lessens the potential long-term cumulative effects on its population. Nesting habitat would be significantly reduced within Timber Management, Modified Landscape, and Scenic Viewshed LUD's (LUD's III and IV). The Old Tom Research Natural Area would provide an area of unfragmented nesting habitat within the Polk Inlet Project Area. The maintenance of 500-foot beach and 1,000-foot estuarine fringe buffers would also provide

some old-growth nesting habitat within LUD's scheduled for harvest activities. These buffer areas and patches of unsuitable and unharvested old growth, however, would also make nest sites more vulnerable to edge-related predation and microclimate changes. Within the Polk Inlet Project Area, the combination of reduced nesting habitat and predation are projected to reduce marbled murrelet populations in the long term.

Two old-growth retention strategies have been identified for this project. Retention Strategy A is associated with Alternative F2 and Retention Strategy B is associated with Alternative F5. Long-term old-growth retention strategies are being evaluated in the current ForestPlan revision process. With implementation of a long-term strategy similar to Retention Strategy A or B, cumulative effects on the goshawk and marbled murrelet would be significantly reduced.

Mitigation

Mitigation for threatened, endangered, and sensitive species results primarily from avoidance of known special use sites such as nest sites for birds and haulout areas for sea lions. Several special use sites were identified during field investigations and literature reviews for the Polk Inlet Project. Mitigation measures, including buffer zones around them, have been designed to avoid these sites during project activities. The final unit layout and road location that would occur before harvest would provide one more level of observation and opportunity for avoidance.

Specific mitigation for marbled murrelets involved modifying harvest unit design to provide 30-acre no-cut buffers around known nest sites (Mitigation Measure W6). This measure has been incorporated into harvest unit design for the three nest site locations where murrelets were confirmed or suspected to be nesting based on field investigations. The specific units receiving this mitigation are noted in Appendix B.

Two probable goshawk sitings were made during field investigations in the Old Franks Creek drainage. Consequently, goshawk surveys would be conducted at the harvest units in this and some other drainages prior to final unit layout (Mitigation Measure W8). Region 10 goshawk management guidelines would then be implemented following surveys in 1993 if nesting is identified.

A Steller sea lion haulout area occurs at Kasaan Point on Grindall Island. Since this location is along the route potentially used by project-related boat traffic, restrictions to Forest Service permitted activities would be implemented to protect the haulout area (Mitigation Measure W11). Project-related boat traffic would be restricted to areas at least one mile from haulouts. Forest-related aircraft flights would also be restricted below 500 feet above sea level within one mile of the haulout area.

For humpback whales, mitigation measures would include: 1) the avoidance of project-related aircraft flights below 500 feet above sea level in the known vicinity of whales; 2) the avoidance of the intentional approach of a vessel of 100 feet or more in length within one-quarter mile of whales; 3) the avoidance of approach of a vessel of less than 100 feet in length to within 100 yards of whales; and 4) the disposal of all cables from inactive LTF sites away from marine environments to prevent potential whale entanglement (Mitigation Measure W12).

Monitoring

Monitoring activities identified under the *Wildlife* section are also relevant to threatened, endangered, and sensitive species. Additional forest-wide monitoring for threatened, endan-

gered, and sensitive species is proposed by the TLMP Draft Revision (1991a) to determine if selected species are being protected (TES Monitoring Item 1). An additional project-specific monitoring activity is identified here.

The buffer zone developed for marbled murrelets is based on the expected adequacy of a 25-to-30-acre buffer to ameliorate microclimatic conditions. The effectiveness of this buffer distance around nest sites, however, is presently unknown. This is of special concern since murrelets may not return to the same nest tree in subsequent years and are known to nest in loose colonies in forest stands (see *Threatened, Endangered, and Sensitive Species* in Chapter 3). Therefore, the buffer zone concept requires monitoring to validate its effectiveness in providing nesting opportunities and ensuring suitable interior forest conditions. Monitoring would be conducted on the implemented buffers in the Polk Inlet Project Area to validate its effectiveness in providing nesting opportunities and ensuring suitable interior forest conditions (see Chapter 2). Monitoring would also provide additional data collection opportunities regarding nest site fidelity and other aspects of the breeding biology for this relatively unknown species.

Biodiversity

Key Terms

Biodiversity—the variety of lifeforms in an area, including variation in structure, composition and function at scales from genetic to landscape.
Canopy—uppermost layer of foliage in the forest.
Edge—the natural or human created boundary between two distinct ecological systems, such as between forest and muskeg, or forest and a clearcut.
Edge effects—the biological and abiotic actions operating at edges; examples are differences in microclimate, species richness, productivity and predation.
Fragmented—reduced in size and connectivity—the degree of fragmentation is dependent upon scale (in space and time) and species specific life requisites.
Forage—to search for food.
Interior—that portion of a forested stand that is not influenced by edge effects.
Patch—an assemblage of similar vegetation—in this document the focus is on old growth forests of greater than 8,000 board feet/acre, with only small inclusions of other habitats.
Planning area—for the purpose of analyzing viable populations, the planning area is the ecological province, i.e., North Central and South Prince of Wales Ecological Province.
Snag—standing dead tree.
Viable population—the number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations well distributed throughout their range in the Tongass National Forest.

Stand and Landscape Biodiversity

Each of the proposed action alternatives would result in changes in biodiversity at the stand, between-stand, and landscape levels. Stand level diversity would decline temporarily as old growth is replaced by clearcuts, gradually increase during mid-seral stages, and decline again during the sawtimber stage as the canopy closes and understory vegetation is eliminated (Sidle 1985). The inclusion of snags and reserve trees as islands of old growth within regenerating stands and precommercial thinning to promote understory vegetation would at least partially offset some of the early seral declines in species richness although thinning has proven to be a short-term effort (Alaback and Tappeiner 1984). Although the inclusion of snags and reserve trees would provide greater structure within regenerating stands, they would be subject to blowdown that would diminish their long-term effectiveness in providing structural attributes for old-growth dependent species. If additional timber is removed from contiguous old-growth patches to compensate for overall reductions in target volumes due to inclusion of some older trees and snags in clearcuts, further reductions in habitat capability would occur for species affected by watershed level changes in the proportion of large old-growth patches.

Between-stand diversity is expected to increase under each of the action alternatives as a result of greater contrast between patch types created by clearcuts in juxtaposition with old growth. Increases in inter-patch contrast would result in greater edge area and more suitable habitat conditions for species associated with forest edges (e.g., crows, jays, ravens, great horned owl). This in turn could result in higher levels of edge-related predation and reductions in nesting productivity for species that are particularly vulnerable to nest-site predation (e.g., marbled murrelet, see *Threatened, Endangered, and Sensitive Species* in Chapter 3) if interior patches are reduced to less than optimum. Between-stand diversity effects would be minimized for

Alternatives F2 and F5, because of greater emphasis placed on retention of contiguous old-growth patches.

Landscape diversity would change under each of the action alternatives (F2 through F5) due to a combination of habitat reduction, habitat fragmentation, and conversion of habitats to second growth. These declines would be offset somewhat by retention of riparian areas, beach fringe, estuary fringes, and old-growth patches. However, the linear configurations of riparian corridors and beach fringes do not provide interior habitat, and may fail to provide protection to old-growth species from edge-related predation and climatic edge effects (Chen et al. 1992, Rosenberg and Raphael 1986). Landscape-level effects would be less under Alternatives F2 and F5 than in 3 and 4. Alternatives F2 and F5 represent better combination of retained habitat for wildlife than Alternatives 3 and 4.

Habitat Diversity

The action alternatives would result in reductions of 7 percent or less in each wildlife habitat type throughout the Project Area. Most habitat losses would occur in old growth forest. Low volume forests would be reduced by 5 to 7 percent, while high volume forests would decline by 2 to 5 percent.

Low, mid, and high elevation old-growth habitat types would be reduced from about 3 to 7 percent of existing conditions under the timber management alternatives. In general, low-elevation old growth, which is included in the low-elevation type, provides optimal deer winter range throughout the Project Area. Both scrub forest and alpine/subalpine habitats would decline by 1 percent or less under the action alternatives. As specified in forest-wide standards and guidelines, no additional harvest would occur in estuary fringe, beach fringe, and inland wetland buffer areas. (See *Wildlife* for a more detailed description of effects on wildlife habitats.)

Forest Fragmentation

Forest fragmentation analysis determined the number of large (10,000 acres), medium (5,000 acres), and small (800 acres) patches (as defined in Chapter 3) that would be available in the Project Area following implementation of the proposed entry into Polk Inlet. Shifts from large patch size classes to smaller patch size classes would occur under the timber management alternatives. Figures 4-17 to 4-23 are detailed maps of forest and interior patch distribution by alternative. Histograms documenting the number of forest patches and interior forest patches by alternative are shown in Appendix C. Each of the alternatives would result in similar declines in the percentage of forest habitat within the large patch size class and increases in the smaller size classes.

Under pre-logging conditions (1954), 68 percent of the CFL within the Project Area was contained in blocks greater than 10,000 acres in size. This was due to the linking of large old-growth blocks by small corridors and linear patches of habitat. Conversely, no interior habitat blocks larger than 10,000 acres existed in 1954, but 71 percent of the total interior area was contained in blocks from 1,000 to 10,000 acres in size. By 1995 (existing conditions, Alternative 1), total forest area and interior area dropped significantly (see Figure 4-18). Conditions under Alternative 1a show slightly less fragmentation than under Alternative 1 (Figure 4-19). Under the action alternatives, the total area of forest patches greater than 5,000 acres is 31 percent for Alternative 3 to 45 percent for Alternatives F2, 4, and F5 (Figures 4-20 through 4-23). This is down from 46 percent under Alternatives 1 and 1a. Interior forest patches within these size classes go to zero for all the action alternatives. This marks a significant redistribution of interior habitat from the larger to smaller patches.

Figure 4-17
Distribution of Forest Interior Patches in 1954

Figure 4-18
Distribution of Forest Interior Patches Under Alternative 1 (Existing Condition)

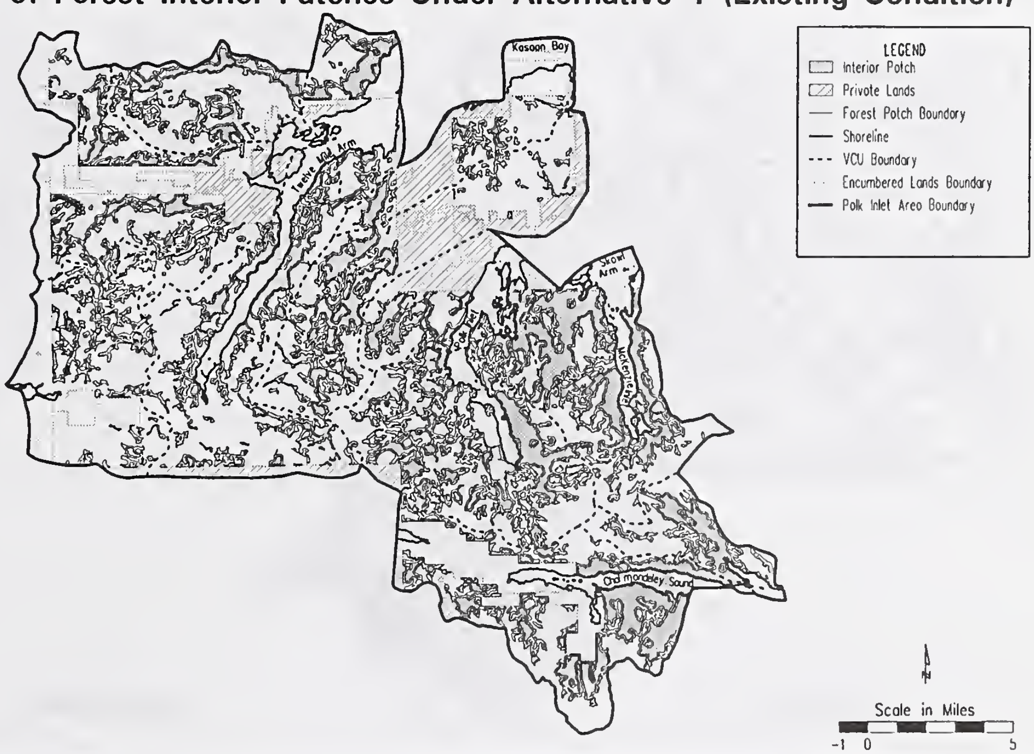


Figure 4-19
Distribution of Forest Interior Patches under Alternative 1a

Figure 4-20
Distribution of Forest Interior Patches Under Alternative F2

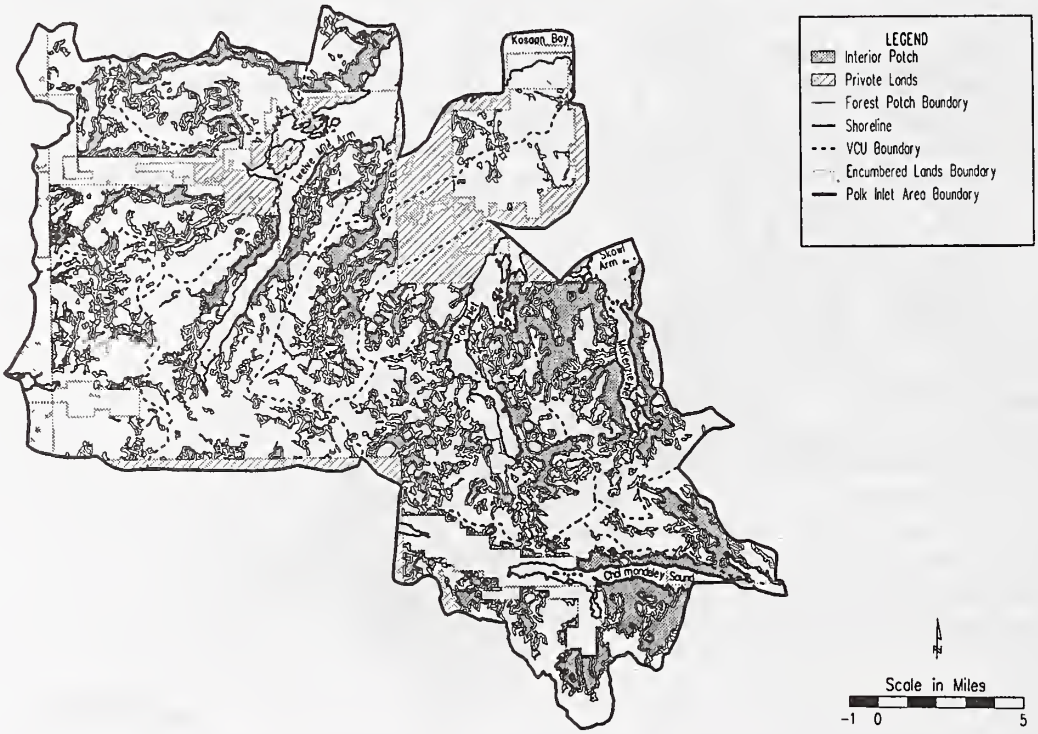


Figure 4-21
Distribution of Forest Interior Patches under Alternative 3

Figure 4-22
Distribution of Forest Interior Patches Under Alternative 4

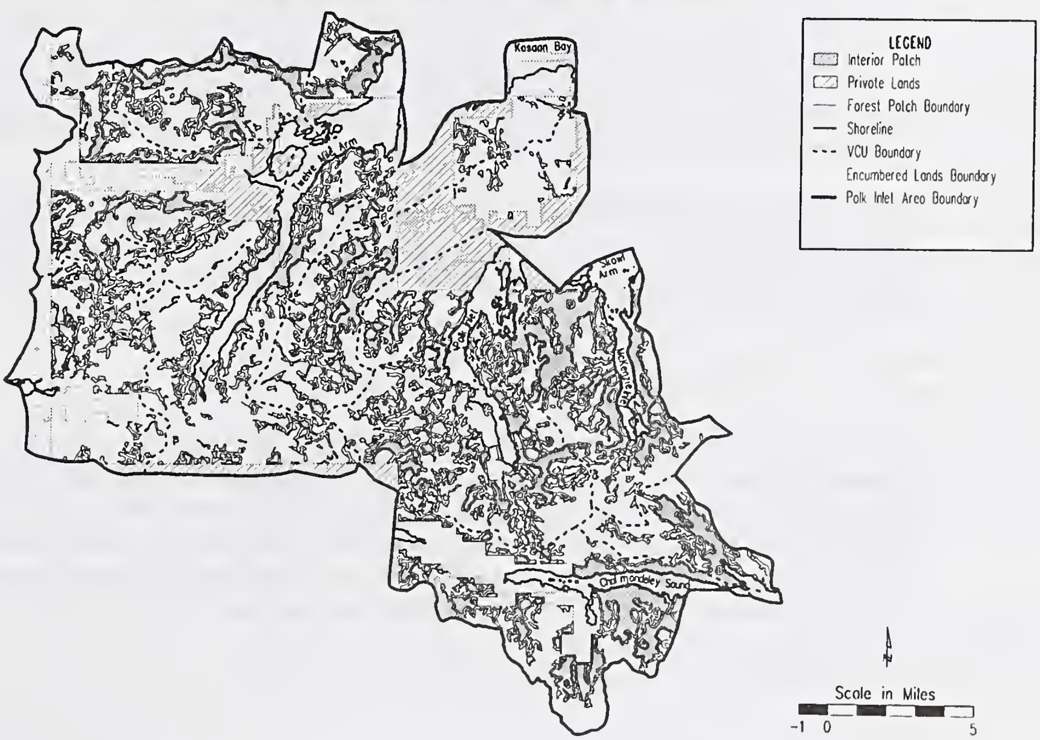
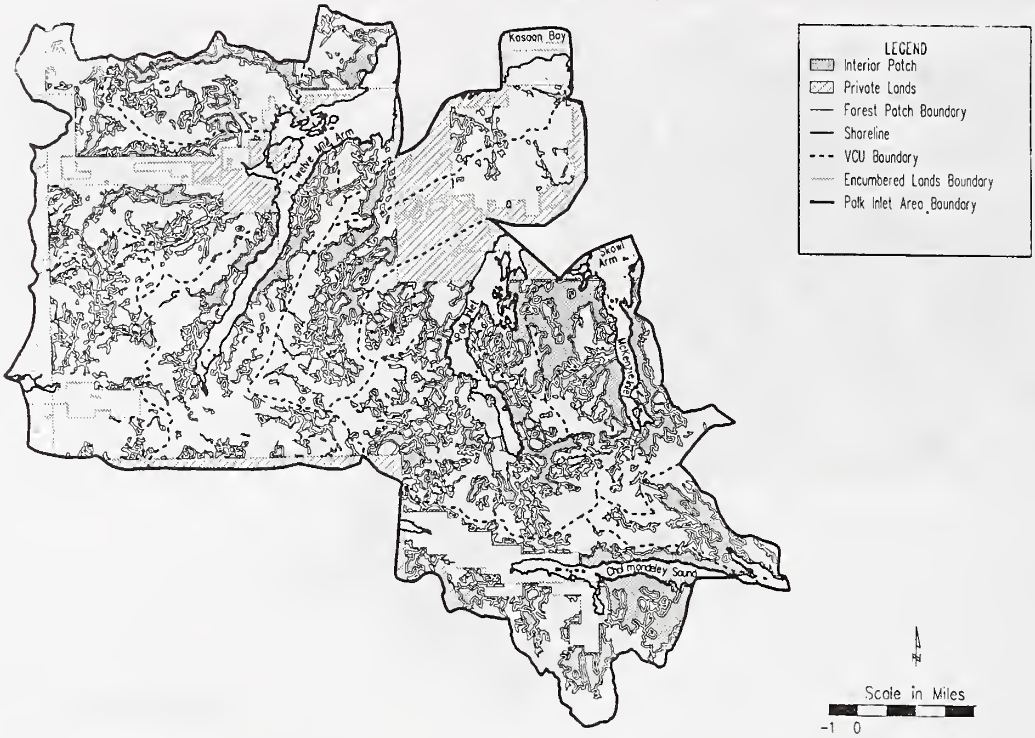


Figure 4-23
Distribution of Forest Interior Patches under Alternative F5



Alternative 3 results in the lowest acreage in forest patches greater than 1,000 acres in size. While this alternative retains a large percentage of interior patches between 1,001 and 5,000 acres in size, it does so at the expense of areas identified as high value for wildlife (Indian Creek, Twelvemile Arm, Upper Old Franks Lake, and Sunny Creek) (see *Wildlife*, Mitigation). Alternative 4 ranks second lowest in terms of acreage of forest patches greater than 1,000 acres in size and also affects many high value areas for wildlife (Twelvemile Arm, Upper Old Franks Lake, and Cannery Creek). Alternative F5 would result in the greatest acreage and Alternative F2 would rank second.

Each of the action alternatives would result in substantial reductions in the percentage of forest habitat within the 10,000-acre size class, particularly the percentage of interior forest habitat. The number of large patches and patch interior habitat would decline further as additional areas are entered for future timber harvest.

Patch-size Effectiveness

Table 4-56 displays the results of patch-size effectiveness for deer, marten, sapsuckers, hairy woodpeckers, and brown creepers. The patch-size effectiveness for the alternatives ranges from 87.9 to 88.4 percent for deer, 93.0 to 93.4 percent for marten, 93.4 to 93.8 percent for sapsuckers, 90.3 to 90.5 percent for hairy woodpeckers, and 99.0 to 99.4 percent for brown creepers. Note that none of the action alternatives are substantially different; however, Alternative F2 ranks highest in patch size effectiveness for four out of five species.

Table 4-56
Patch-size Effectiveness (PSE) Values for Five Management Indicator Species, by Alternative

		Alternatives					
		1a	1	F2	3	4	F5
Species	1954	1994	1995	1998	1998	1998	1998
Sitka black-tailed deer	0.956	0.907	0.902	0.884	0.879	0.882	0.884
Marten	0.974	0.949	0.943	0.933	0.930	0.934	0.932
Red-breasted sapsucker	0.975	0.952	0.946	0.938	0.934	0.938	0.936
Hairy woodpecker	0.936	0.924	0.920	0.905	0.903	0.905	0.904
Brown creeper	0.997	0.994	0.994	0.994	0.990	0.994	0.991

SOURCE: Forest Service, Ketchikan Area, database.

Population Distribution

Maintenance of viable wildlife populations well distributed across National Forest System lands, where multiple-use management is emphasized in the resource planning process, should be soundly based on conservation biology principles. To accomplish this, biologists indicate that sufficient amounts of suitable habitat areas should remain well distributed across the Tongass National Forest (36 CFR 219.19).

On the Tongass National Forest, multiple-use management and biodiversity objectives have resulted in the formation of several LUD's within which particular resources have been emphasized. As such, the intensity of resource extraction (e.g., timber harvest) has been distributed across the forest with some areas planned for more extensive development (e.g., LUD's III and IV) than others (e.g., LUD's I and II). The productive old growth within LUD's III and IV on the Ketchikan Area, for instance, has been harvested or is scheduled for harvest while timber harvest has been excluded from other areas (e.g., LUD I and II, Research Natural Area and Special Interest Areas). Over the long term, old-growth in LUD's III and IV would be retained primarily in beach and estuary fringes, Research Natural and Special Interest Areas, Wild and Scenic River corridors, Class I and II stream buffers, and productive and unproductive forest areas not scheduled for timber harvest (Forest Service 1991). Old-growth blocks are most likely to maintain viable wildlife populations in an area, while beach and estuary fringe areas are more likely to serve as corridors than as "source" areas for maintaining viable populations. Moreover, islands that are isolated from mainland areas can be subject to the combined effects of timber harvest and island biogeographic factors that operate negatively on population viability and species richness (see Harris 1984, Sidel 1985, Suring et al. 1992). Consequently, such areas are more likely to experience bioregional and local extirpations because of their isolation from species-rich mainland habitats.

Several areas on Prince of Wales Island occur near the Project Area where timber harvest is restricted or prevented by TLMP LUD's. The Karta Wilderness Area (Management Area K16) occurs along the northern boundary of the Project Area. This wilderness area is

bordered by Management Area K15 to the north and the Project Area to the south. Most of Management Area K15 has been designated as Modified Landscape or Timber Management area; consequently, it is unknown whether timber management in Management Area K15 would result in isolation of the Karta Wilderness from other special land use areas to the north such as the Honker Divide. In addition, the lands to the south of this wilderness have been extensively harvested and the wilderness may be isolated from other old-growth areas to the south.

Another large block of old growth occurs in the Project Area in Old Tom Creek Research Natural Area. This area is bordered by private lands to the north and surrounded by LUD IV lands. Additional old-growth areas just south of Cholmondeley Sound and outside the Project Area include the LUD II in Management Area K27A, the wilderness area in Management Area K27, and the Semi-Primitive recreation area in Management Area K26. However, Sulzer Portage, which is the only land bridge across Cholmondeley Sound, has been withdrawn for a Haida Corporation land exchange; therefore, the connection between the natural area and old growth south of Cholmondeley Sound may have timber harvest in the future if conveyed.

The acreage of harvest proposed under each alternative within previously mapped old-growth areas (retention and extended rotation) is shown in Table 4-57. Alternative 1 would result in no change in the 18,299 acres remaining unharvested in 1994. Alternative 1a would prevent the already scheduled harvest of 824 acres resulting in 19,123 acres remaining unharvested. The action alternatives would result in the harvest of from 4 to 8 percent of the acres of previously mapped old growth existing under Alternative 1. The largest harvest would occur with Alternatives 3 and 4 which would result in from 16,926 to 17,012 acres remaining unharvested. The least harvest would occur under Alternatives F2 and F5 which would result in from 17,354 to 17,516 acres remaining unharvested.

Table 4-57
Proposed Harvest within Previously Mapped Old-growth Areas, by Alternative

VCU	Total Acres	1995 Unharvested	Acres of Harvest by Alternative 1a	1	F2	3	4	F5
610	0	0	0	0	0	0	0	0
611	385	385	0	0	0	32	0	0
612	306	306	0	0	1	76	65	1
613	1,314	1,244	0	0	30	372	145	30
618	3,286	2,951	-355	0	0	0	117	208
619	1,720	1,259	0	0	2	0	2	2
620	3,655	3,025	0	0	402	46	402	402
621	4,362	4,058	-304	0	184	631	389	174
622	1,306	1,221	-85	0	43	43	20	27
624	743	643	-100	0	101	101	42	101
674	2,240	2,240	0	0	0	0	105	0
675	897	897	0	0	0	72	0	0
Total	20,214	18,299	-824	0	763	1,373	1,287	945
% of Existing			-5	0	4	8	7	5

SOURCE: Forest Service, Ketchikan Area, database.

Old-Growth Retention

After evaluating the several old-growth conservation strategies described in Chapter 3 (see *Biodiversity*), the review of the wildlife management and conservation biology on the Tongass National Forest conducted by the Pacific Northwest Research Station (Kiester and Eckhardt 1994), and considering the old-growth blocks and corridors in the Project Area (see Biodiversity, Chapter 3) and other Project Area characteristics, two project-specific old-growth retention strategies were developed for the Polk Inlet Project. These retention strategies incorporate blocks of old-growth referred to as Habitat Conservation Areas (HCA's). They also identify corridors that are important for maintaining connectivity between blocks, but which are not themselves identified as retention. No harvest is permitted within the blocks. Harvest is permitted within the corridors consistent with the continued functioning of the corridors. Subsequent projects and NEPA analysis may specify changes in the locations of these areas; however, sufficient acreage will exist in an old-growth condition to meet the requirements for the Old Growth prescription specified in the 1979 TLMP (as amended) as long this requirement is in place.

Old Growth Retention Strategy A (see Figure 2-1 in Chapter 2) is consistent with the recommendations of the VPOP Committee (Suring et al. 1993) and considered further the review of the wildlife management and conservation biology on the Tongass National Forest conducted by the Pacific Northwest Research Station (Kiester and Eckhardt 1994), in terms of the number, size, and distribution of HCA's. It includes three medium HCA's, four small HCA's, and nine corridors. The corridors were identified in conjunction with the corridors provided by beach fringe and estuary buffers, stream and lake buffers, and other areas not scheduled for harvest. A summary of the size of each block and corridor and the amount of existing old growth within each block and corridor is as follows:

	Old Growth Acres	Total Acres
Medium HCA's		
West Shore Twelvemile/Trocadero	3,463	14,588
East Shore Twelvemile/Old Franks	4,833	9,966
Old Tom/McKenzie/Goose Bay	7,870	12,199
	16,166	36,753
Small HCA's		
Indian Creek/Harris River	1,643	4,864
Polk Inlet/Dog Salmon	1,722	3,564
Sunny Creek	1,950	3,118
Big Creek	2,760	4,302
	8,075	15,848
Corridors	4,739	16,336

Old Growth Retention Strategy B (see Figure 2-2 in Chapter 2) incorporates and goes well beyond the recommendations of the VPOP Committee in terms of the number, size, and distribution of HCA's. In this regard, it provides more options for the future in terms of old-growth habitat preservation. It includes three medium HCA's, three small HCA's, and ten corridors. The medium and small HCA's are generally much larger than for Retention Strategy A and the corridors are generally much wider, permitting the matrix of habitats within them to be managed. A summary of the size of each block and corridor and the amount of existing old growth within each block and corridor is as follows:

	Old Growth Acres	Total Acres
Medium HCA's		
West Shore Twelvemile/Indian Creek	4,979	15,173
East Shore Twelvemile/Old Franks	5,237	10,963
Old Tom/McKenzie/Goose Bay	7,870	12,187
	18,086	38,323
Small HCA's		
Polk Inlet/Dog Salmon	2,065	4,309
Sunny Creek/N. Shore Cholmondeley	4,327	9,434
Big Creek/Cannery Creek	2,695	9,110
	12,087	22,853
Corridors	16,021	56,324

Alternatives 1 and 1a would fully maintain the old-growth acreages identified above under either retention strategy. In addition, Alternative 1a would prevent some scheduled harvest inside the West Shore Twelvemile/Indian Creek and the Old Tom/McKenzie/Goose Bay HCA's, as well as in the One Duck/Twentymile and the Omar Creek corridors.

Alternatives F2 and F5 would have from no effect to little effect on the retention strategies. Alternative F2 would fully avoid harvesting within any of the old-growth blocks or corridors of Retention Strategy A. It would result in harvesting 9 units in medium HCA's, 1 unit in small HCA's, and 13 units in the corridors of Retention Strategy B. Alternative F5 would fully avoid harvesting within any of the old-growth blocks of either retention strategy; it would only allow harvesting of 5 units within the corridors of Retention Strategy B.

Alternatives 3 and 4 would involve substantial harvest within areas identified under both retention strategies. Alternative 3 would allow 37 units to be harvested in medium HCA's, 11 units in small HCA's, and one unit in the corridors of Retention Strategy A. Similarly, 46 units would be harvested in medium HCA's, 12 units in small HCA's, and 8 units in the corridors of Retention Strategy B. Under Alternative 4, substantial harvest would also occur in HCA's and corridors, although not as extensively as under Alternative 3. Harvest would include 22 units in medium HCA's and 1 unit in a small HCA of Retention Strategy A and 25 units in medium HCA's, 4 units in small HCA's, and 11 units in the corridors of Retention Strategy B. The level of harvest produced by Alternatives 3 and 4 would compromise the ability of the HCA's and corridors of either retention strategy to function within the Project Area.

Cumulative Effects

At the end of the first rotation in 2054, most suitable and available CFL will have been harvested, with the exception of 7,270 acres remaining, primarily due to inaccessibility and retention in scenic viewsheds (see *Wildlife*, Cumulative Effects). In addition, 17,815 acres of unsuitable and unavailable old growth would remain assuming no additional harvest of old growth in the Maybeso Experimental Forest. Figure 4-24 displays the remaining old-growth habitat assuming only the 17,815 acres of unsuitable/unavailable old growth remains. The 7,270 acres of suitable and available CFL remaining in 2054 would mostly occur as isolated small patches, as buffers along currently unmapped streams, and in scenic viewshed LUD's. Landscape-level biodiversity would decline significantly within the Polk Inlet Project Area by

2054. At this time, about 25,000 acres of old growth would remain, distributed in the Maybeso Experimental Forest, the Old Tom Research Natural Area, beach and estuary fringes, stream and riparian buffers, and areas with very high MMI soils (see Table 3-24), but the only significant blocks of old growth would be the Old Tom Research Natural Area and the Maybeso Experimental Forest. If the remaining old growth in the Maybeso Experimental Forest is harvested, then only one significant old-growth block would remain. All other old-growth habitat would consist of small patches or linear corridors with little or no interior habitat.

Under Retention Strategies A or B, the amount and distribution of old-growth in 2054 would be substantially improved over the current plan. The TLMP Revision Team is currently developing a new draft forest plan that will incorporate a revised long-term old-growth retention strategy. It is highly probable that this new strategy will substantially reduce long-term cumulative effects on biodiversity and old-growth habitat.

Mitigation

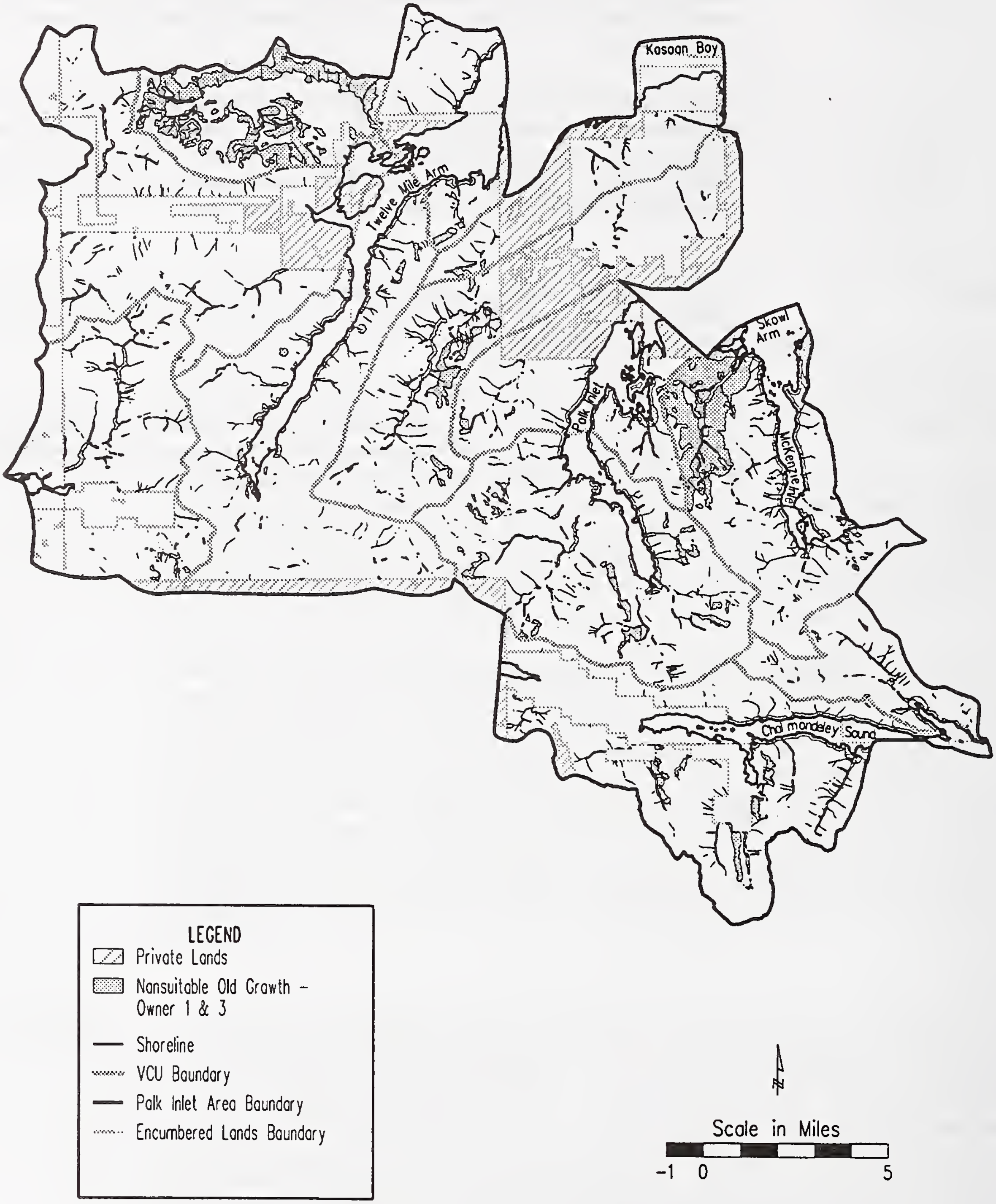
Mitigation measures relating to wildlife and threatened, endangered, and sensitive species are applicable to biodiversity. These mitigation measures are discussed in *Wildlife* and *Threatened, Endangered, and Sensitive Species*.

Monitoring

Monitoring activities relating to wildlife and threatened, endangered, and sensitive species are applicable to biodiversity. These monitoring activities are discussed in the *Wildlife* and *Threatened, Endangered and Sensitive Species* sections.

Figure 4-24

Remaining Old-growth Habitat under Maximum Cumulative Harvest (assumes no additional harvest of old growth in Maybeso Experimental Forest)



Lands

Key Terms

Alaska Native Claims Settlement Act (ANCSA)—provides for the settlement of certain land claims of Alaska Natives.
Encumbrance—a claim, lien, charge, or liability attached to and binding real property.
Native selection—application by Native corporations to the USDI Bureau of Land Management for conveyance of a portion of lands withdrawn under ANCSA in fulfillment of Native entitlements established under ANCSA.
Special use permits—permits and granting of easements (excluding road permits and highway easements) authorizing the occupancy and use of land.
State selection—application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska, under the Alaska Statehood Act.

Harvest Units Adjacent To Non-National Forest System Lands

Under the alternatives, seven proposed harvest units would be located adjacent to non-National Forest System land. These units must have boundary lines established prior to implementation to ensure that harvest does not encroach on non-National Forest System land. Table 4-58 shows the units that are adjacent to non-National Forest System lands.

Table 4-58
Proposed Harvest Units Adjacent To Non-National Forest System Land

VCU	Survey Number	Location	Harvest Unit	Status
613	50-90-0551	Sealaska	202	Patent
613	50-90-0551	Sealaska	275	Patent
622	AA63729	Harris River Road SS	201	Selected - Not conveyed
622	AA63729	Harris River Road SS	205	Selected - Not conveyed
622	AA63729	Harris River Road SS	212	Selected - Not conveyed
624	AA71751	Trocadero SS	222	Selected - Not conveyed
675	PL-96-487	Chomley/ Kootznoowoo	265	Native Withdrawal

SOURCE: Forest Service, Ketchikan Area, database.

Rights-of-Way

Logging activities located on Forest Service lands that are adjacent to non-National Forest System lands may require right-of-way agreements. Agreements may be necessary for establishing tailholds, suspending logging cables over non-National Forest System roads or lands. It will also be necessary to directionally fall timber away from non-National Forest lands. These requirements will be analyzed and negotiated on a case-by-case basis, depending on site-specific logging/transportation systems.

The Forest Service currently has a road right-of-way easement in VCU 612 from a potential LTF site at Little Coal Bay through State-selected lands to National Forest System land. The State has indicated to the Forest Service that if the Forest Service desires to build an LTF at Little Coal Bay, the State will grant an easement for approximately 3 acres of land.

Transportation and Facilities

Key Terms

Access management—acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands.
A-frame LTF—log transfer facility system which consists of a stationary mast with a falling boom for lifting logs from trucks to water. This system is generally located on a shot rock embankment with a vertical bulkhead to access deep water, accommodating operations at all tidal periods.
Arterial roads—roads usually developed and operated for long-term land and resource management purposes and constant service.
Collector roads—collect traffic from Forest Local roads; usually connect to a Forest Arterial road or public highway.
Local roads—provide access for a specific resource use activity such as a timber sale or recreational site; other minor uses may be served.
Log Transfer Facility (LTF)—a facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft.
Low-angle ramp LTF—log transfer facility system which consists of a drive-down slide ramp with slide rails for pushing log bundles into the water.
Marine benthic habitat—the area occupied by the aggregate of organisms living at or on the bottom of water body.
Modular bridge—a portable bridge constructed of components that can be readily assembled and disassembled for movement from one site to another.
Pre-haul maintenance—work performed prior to use of a road for timber harvest activities; includes blading, shaping, and brush removal.
Temporary roads—short term roads built for limited resource activity or other project needs.
Traffic service levels—traffic characteristics and operating conditions that are used in setting road maintenance levels.

Introduction

The effects of the transportation system on other resources are considered in the specific resource sections (e.g., soil; watershed, fish, and fisheries; recreation). This section focuses on the effects of each alternative on the transportation system. The discussion is grouped into the following categories: (1) road development, (2) road development costs, (3) rock quarries, (4) maintenance level, and (5) access management.

Road Development

Table 4-59 displays the miles of new and reconstructed roads by alternative. Road reconstruction consists of roadbed repairs, culvert or bridge replacement, and resurfacing. Alternatives 3 and 4 would have the most miles of road construction. Alternative F2 would have an intermediate level of road construction. Alternative F5 would have the least miles of needed road, a result of having the largest number of helicopter units.

Alternative F2, with 42.2 road miles, would extend roads from those of the 1989-94 EIS in the Coal Bay area and would extend the road system on the southeastern share of Twelvemile Arm. Other roads would be predominantly short local roads.

Table 4-59
Miles of New and Reconstructed Road by Action Alternative

	Alt. F2		Alt. 3		Alt. 4		Alt. F5	
VCU	New	Recon.	New	Recon.	New	Recon.	New	Recon.
610	0	0	0	0	0	0	0	0
611	0	0	4.1	0.3	0	0	0	0
612	6.4	0	3.6	0	8.7	0	6.4	0
613	6.5	0	5.2	0	7.5	0	6.5	0
618	0	0	0	0	1.8	0	0	0
619	1.9	0	0	0	1.9	0	1.9	0
620	11.4	0	6.6	0	8.4	0	8.2	0
621	10.2	0	19.9	0	16.8	0	10.1	0
622	2.2	0	6.4	1.2	5.2	1.2	0.5	0
624	3.4	0	4.5	0	2.0	0	3.4	0
674	0.2	0	0	0	1.8	0	0	0
675	0	0	5.7	0	0	0	0	0
Subtotal	42.2	0	56.0	1.5	54.1	1.2	37.0	0
Total New and Re-constructed	42.2		57.5		55.3		37.0	

SOURCE: Forest Service, Ketchikan Area, database.

Alternative 3, with 57.5 road miles, would extend existing roads into the Indian Creek watershed and then continue down the west side of Twelvemile Arm; extend existing roads through the Old Franks drainage into VCU 611 near Twelvemile Arm; and have a new road system developed in Sunny Creek off Cholmondeley Sound. Because a new road would extend to an LTF at Sunny Creek, approximately 600 feet of road would be constructed through the beach buffer.

Alternative 4, with 55.3 road miles would extend existing roads into the Indian Creek and then continue down the west side of Twelvemile Arm; extend existing roads through the Old Franks drainage into VCU 611 near Twelvemile Arm (though not as far as Alternative 3); extend roads from those of the 1989-94 EIS in the Coal Bay area and on the west side of McKenzie Inlet; and have a new road system developed in Cannery Creek off Cholmondeley Sound. Because a new road would extend to an LTF at Cannery Creek, approximately 500 feet of road would be constructed through the beach buffer.

Alternative F5, with 37.0 road miles, would extend roads from those of the 1989-94 EIS in the Coal Bay area and extend the road system on the southeast side of Twelvemile Arm. The remaining roads would be predominantly local roads extending off existing roads.

Three classes of road would be constructed as part of the proposed project, each of which has different projected uses and construction standards. The three classes are: arterial, collector, and local roads. Temporary roads, which are short-term roads for timber harvest activities only, were considered local roads for analysis purposes since these roads are similar to local roads.

Typical forest road

Arterial and collector roads are generally mainline system roads requiring higher standards and heavier investment to provide prolonged multiple use. These roads can be built to lower standards initially and upgraded as use is intensified. Thus the logging operator may construct arterial and collector roads to low or medium standards depending on use.

Local roads tend to be utilized intermittently allowing use of lower standards. Thus local roads are generally less costly than the arterial and collector roads. These roads may have use restrictions during harvest activities that limit public access.

The number of miles of arterial, collector, and local roads to be constructed under each action alternative are shown in Table 4-60. The number, length, and class for each road segment is presented along with other road attributes for each alternative in Appendix D, Road Management Objectives.

Table 4-60
Miles of Road Construction/Reconstruction by Road Class and Alternative

Road Class	Alternative F2	Alternative 3	Alternative 4	Alternative F5
Arterial	0	0	0	0
Collector	2.8	4.6	7.4	2.8
Local	39.4	52.9	47.9	34.2
Total	42.2	57.5	55.3	37.0

Rock Quarries

Generally rock quarries are located every 1 to 2 miles along roads. The quarry location is determined by quality rock sources, haul distances, development costs, frequency of entry, and visual resource considerations. An allowance for rock quarries is included in the acres shown for road right-of-way clearing (see *Soils* in this chapter). During field verification, 28 quarry sites were noted.

Some rock quarries are small and would involve one-time uses, while others would be expanded during future road building operations if quality rock is available. Rock quarries with expansion potential would be retained for expansion, particularly in situations where potential roads and timber harvest may be developed in the future, or where numerous roads radiate out from a point near a centralized quarry. Rock quarries near the ends of the road system would be closed and reclaimed by spreading stockpiled overburden on the floor of the quarry.

Each quarry would be evaluated for disposition during the construction stage. Each quarry would be evaluated for the following: (1) availability of additional quality rock, (2) feasibility of expansion, (3) future rock resource needs in the area, and (4) proposed visual quality objectives.

Maintenance Level

Public access would continue under all action alternatives and would be increased due to additional road mileage. Specifically, the Polk Inlet arterial (Forest Road 21) would remain open providing access to Twelvemile Arm and Polk Inlet. The Polk Inlet arterial would be maintained at Maintenance Level 3 and Traffic Service Level B. At this level, travel by passenger vehicles is anticipated but driver convenience and comfort are not priorities. The Polk Inlet Road will receive increasing traffic during this entry. Roadside alder management would be conducted to improve site distances. Additionally, vehicle turnouts would be constructed for enhanced safety.

Table 4-61 shows the traffic service levels associated with road maintenance levels by alternative. Maintenance levels and Traffic Service levels are shown by specific road segment in Appendix D.

Table 4-61
Miles of Road by Traffic Service Level by Alternative

Traffic Service Level	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Level C	5.6	4.6	10.2	5.6
Level D	36.6	52.9	45.1	31.4
Total	42.2	57.5	55.3	37.0

Generally, collector roads would remain open to meet long-term objectives. Maintenance of these roads would consist of monitoring road and drainage structures for function and environmental condition. Maintenance levels would fluctuate in response to changing uses. During periods of limited use, maintenance standards are sufficient to provide only for public safety and resource protection (i.e., Maintenance Level 2 and Traffic Service Level C). This level road is maintained for high clearance vehicles and passenger car traffic is not a consideration. Local roads to harvest units, including the short road segments for yarders within harvest

units, would not be retained as part of the permanent transportation system. These roads receive Maintenance Level 1 and Traffic Service Level D. After these roads have served their intended purpose, the roadbed would be effectively blocked to normal vehicular traffic, the drainage structures removed, and the roadbed would be waterbarred. Some of these roads are temporary but are considered here as local roads. Because such roads may be constructed through rock, they cannot easily be blocked.

Access Management

Specific post-harvest traffic strategies or access management are described below with regard to fisheries, wildlife, and recreation concerns. Access might be encouraged, accepted, discouraged, eliminated, prohibited, or prohibited seasonally. Access into newly entered drainages would be discouraged or prohibited to minimize wildlife impacts unless there is a specific recreational opportunity. Roads are closed for several reasons, including fish and wildlife protection, public safety, and inadequate maintenance funding. Roads under Forest Service jurisdiction can be closed by authority of CFR 36, Chapter 11, Parts 212.7 and 261. Road closure orders would be posted at the Craig Ranger District Office. Because U.S. mining laws confer a statutory right to enter public lands to search for minerals, access to mining claims will not be restricted. However, miners and prospectors would be required to obtain a permit to use restricted roads.

Access management for Polk Inlet Project roads is summarized in the following paragraphs. Appendix D presents the proposed access management for each road segment.

Motorized road access into the Indian Creek drainage would be prohibited to protect wildlife resources, specifically wolves and an ongoing ADF&G study of them. Motor vehicle use would be prohibited by a road order, i.e., closure. This access strategy would be implemented in all alternatives.

Access into the Old Franks drainage would stop at the southernmost lake near Harvest Unit 613-228. Access to this point would be encouraged for recreation purposes and appropriate signing and active road maintenance would occur. Hiking and canal access to the Old Franks Lake network would be from this site. Beyond this point, access would be eliminated (i.e., the road would be physically blocked by an impassable barricade). This access strategy would be implemented in Alternatives 3 and 4.

Access to the Sunny Creek road off Cholmondeley Sound would be at the discourage level—alder would be allowed to grow and blowdown would not be removed. This access strategy would be implemented in Alternative 3.

Access to the Cannery Creek road off Cholmondeley Sound would also be at the discourage level. This access strategy would be implemented in Alternative 4.

Access to the east side of Twelvemile Arm in the vicinity of Harvest Units 621-259, 621-261, 621-262, and 621-264 would be at the discourage level. Hunting access to this low- elevation deer winter range is already available by boat. Allowing alder to grow and not removing blowdown would minimize hunting pressure from the land side of this area. This access strategy would be implemented in Alternatives F2, 3, 4, and F5.

The road in the Old Franks drainage gives access to deer summer range to the west of Cabin Creek. Consequently, access into upper Cabin Creek in the vicinity of Harvest Units 619-209, 619-212, 619-213, and 619-215 would be at the discourage level to minimize hunting pressure on deer. This access strategy would be implemented in Alternatives F2, 4, and F5.

The road to Units 620-291 and 620-349 would remain open to provide access to the unnamed lake uphill from the road. A three-car pullover area is recommended. This road should be provided with enough turnouts to provide maximum safety for recreationists using this mountainous road.

Access into the Coal Bay area would be at the discourage level. This access strategy would be implemented in Alternatives F2, 4, and F5.

Access to Harvest Units 618-238 on the west side of McKenzie Inlet would be at the discourage level. This access strategy would be implemented in Alternative 4.

Roads to Harvest Units 619-270 and the 1989-94 EIS roads leading to Units 619-106, 619-107, and 619-108 on the east side of Polk Inlet provide access to the Old Tom Research Natural Area. Access to this area will be at the discourage level. It is recommended that these roads be seasonally closed during deer-hunting season to minimize impact and that this access strategy be implemented in all action alternatives.

Logging Camps

Logging camps to house workers who would implement the action alternatives will seek to utilize existing facilities or previously used sites to the extent possible. The floating logging camp at lower Polk Inlet would be used for harvest within the Polk Inlet and Twelvemile Arm areas. The existing logging camps at Dora Bay would provide access for harvest in either Sunny or Cannery creeks. These camps would be preferable to siting and permitting new ones at Sunny Cove or elsewhere in Cholmondeley Sound. There are currently two permits for logging camps at McKenzie Inlet. Alternatively, previously used camp sites at Cabin Creek in Polk Inlet and to the east of Little Goose Bay in Skowl Arm might be used for access to McKenzie Inlet. For access to the northern Project Area, previously used camp sites at Kina Cove or Coal Bay could be used. Alternatively, workers could use existing housing at Kasaan or a new camp could be sited at Daisy Island.

Log Transfer Facilities (LTF's)

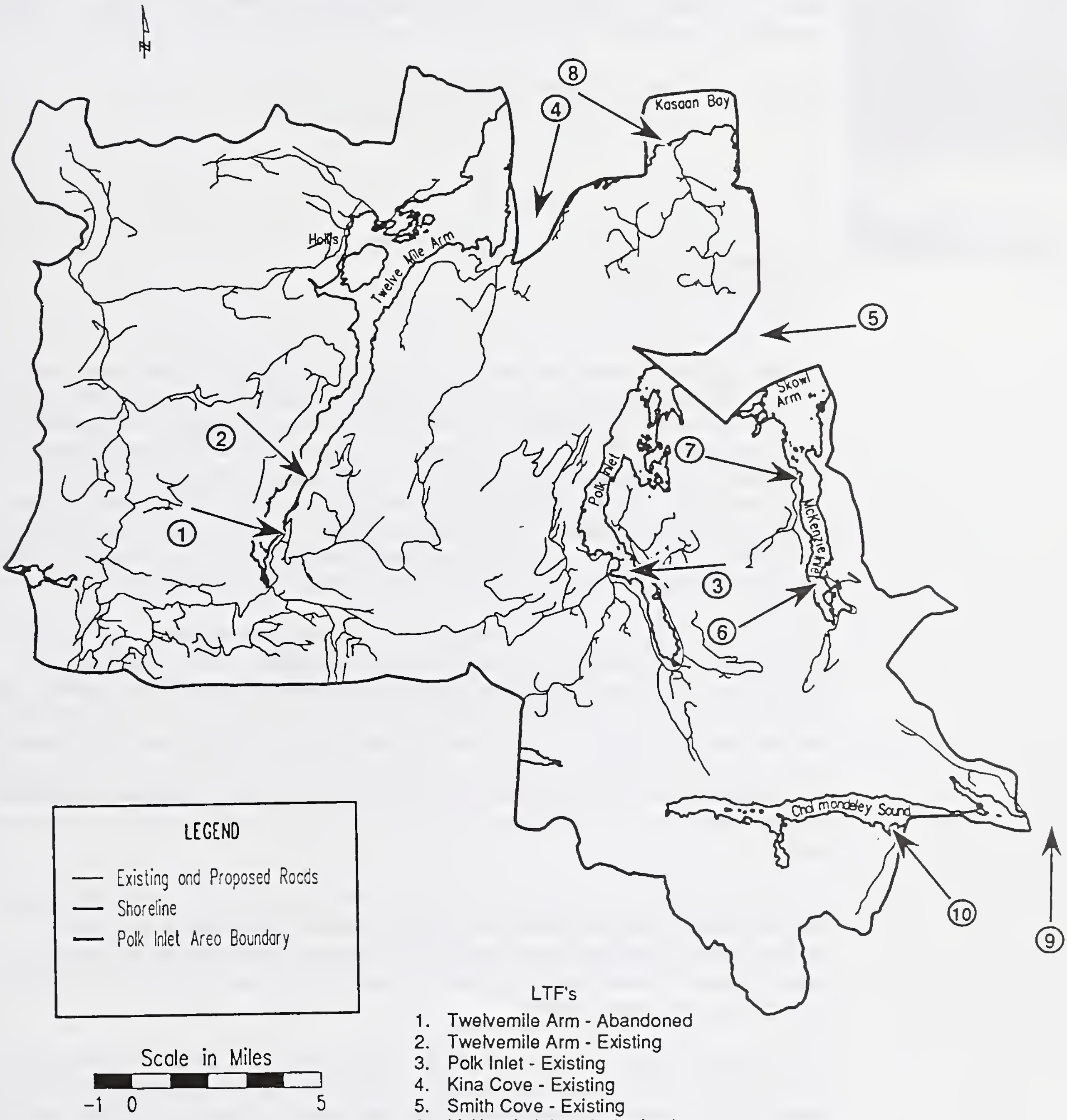
Existing, authorized (1989-94 EIS) and proposed LTF's for the Polk Inlet Project Area are shown in Figure 4-25 and listed in Table 4-62. Under the No-Action Alternative, use of all existing and previously planned LTF's would continue. Under Alternative 1a, the Twelvemile Arm and Polk Inlet LTF's would continue operation until permitted harvest was completed. Generally, action alternatives would utilize existing or planned LTF's within the Project Area:

- Existing LTF's at Polk Inlet and Twelvemile Arm would continue to be used in all action alternatives;
- The planned Coal Bay LTF would be used in Alternatives F2, 4, and F5;
- The planned LTF on west McKenzie Inlet would be used in Alternatives 4 and F5;
- The Cannery Creek LTF would be used in Alternative 4; and
- The Sunny Point LTF would be used in Alternative 3.

The planned LTF on east McKenzie Inlet would not be used in any action alternative because units in this area would be helicopter logged directly to saltwater.

A total of 14 LTF sites were investigated in the Project Area during the 1989-94 EIS and 6 of these sites were identified as preferred sites. Of the 6 sites, 4 have been proposed for this project: McKenzie Inlet (east), McKenzie Inlet (west), Little Coal Bay, and Cannery Creek. Sunny Point was not preferred, but is proposed for the Polk Inlet Project.

Figure 4-25
Location of Existing, Authorized, and Proposed Log Transfer Facilities for the Polk Inlet Project Area



LTF's
1. Twelvemile Arm - Abandoned
2. Twelvemile Arm - Existing
3. Polk Inlet - Existing
4. Kina Cove - Existing
5. Smith Cove - Existing
6. McKenzie Inlet - Authorized
7. McKenzie Inlet - Authorized
8. Coal Bay - Authorized
9. Sunny Point - Proposed
10. Cannery Creek - Proposed

Typical LTF

Table 4-62
Existing, Planned, or New LTF's (by Alternative)

Alt.	Twelvemile Arm[1/]	Polk Inlet[1/]	Coal Bay[2/]	East McKenzie[2/]	West McKenzie[2/]	Sunny Point[3/]	Cannery Creek[3/]
1	✓	✓	✓	✓	✓		
1a	✓	✓					
F2	✓	✓	✓				
3	✓	✓				✓	
4	✓	✓	✓		✓		✓
F5	✓	✓	✓				

1/ Existing LTF.
2/ Planned LTF, 1989-94 EIS.
3/ New LTF.

The major potential impact involving LTF's is the accumulation of log debris in the marine environment. During the transfer of logs from land to water, bark would be sloughed off and could be deposited on the ocean bottom; bark also is continually sloughed off by agitation by wind and waves while logs are in rafts. Bark accumulation on the bottom can diminish habitat for bottom-dwelling crustaceans and mollusks, as well as hamper underwater vegetation used as food and rearing sites for marine fish and other organisms. All LTF's in the Project Area have been designed to maximize flushing suspended bark away from the LTF area to the open sea before it can accumulate on the bottom. The discharge of bark into the water at an LTF is a discharge requiring a National Pollution Discharge Elimination System (NPDES) permit.

The existing LTF's operate under regulations that apply to existing permits. The authorized LTF's will be operated under the regulations that were in effect when the permits were granted. The Polk Inlet LTF operates under a permit that does not require monitoring. The Twelvemile LTF operates under a permit that does require monitoring. The Twelvemile LTF has been operating since 1992. The June 1993 dive survey (Forest Service 1993) indicates an average bark depth of 6.9 centimeters. An area of approximately 0.08 acre has 100 percent cover greater than 10 centimeters deep. The report states that the new debris accumulation does not appear to have significantly impacted the marine life compared to the previous year's survey.

The Sunny Point facility was not preferred in the 1989-94 EIS. The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) performed a cursory investigation of the site and found it to be highly productive with rock shelves which could trap bark debris. Consequently, they did not recommend the site. However, the LTF was found acceptable to the ADF&G.

Under Alternative 3, the Sunny Point LTF would be active for 1 to 2 years and would handle approximately 5 MMBF of timber. Because of adjacency guidelines, no entry would occur for another 10 to 15 years. The open nature of the site would allow some tidal flushing, and the initial effects on marine life would be limited. The 10 to 15 years until the next entry would allow a level of recovery from these effects. The Sunny Cove LTF is greater than one mile from the oyster mariculture sites within the cove. Consequently, significant adverse effects are not anticipated to these sites.

Helicopter Yarding of Logs to Saltwater or Barge

Helicopter yarding to saltwater or barge would be required for helicopter units along eastern Twelvemile Arm, eastern McKenzie Inlet, and western McKenzie Inlet. These three sites have deep waters that are both close to shore and far from Class I stream mouths. Consequently, helicopter yarding of logs from harvest units in these areas would minimize effects that would occur if the logs were taken to the normal LTF's for transfer into saltwater. Yarding to these sites would have to be done before April or after July to avoid smolt outmigration periods. Trees should be limbed prior to yarding to reduce debris potential.

Saltwater helicopter yarding would occur from east Twelvemile Arm in Alternative 3 and from west McKenzie Inlet in Alternative 4.

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Economic and Social Environment

Key Terms

Cant—a squared log destined for further processing.
Discounted benefits—the sum of all benefits derived from the Project Area over the life of a project.
Discounted costs—the sum of all costs incurred from the Project Area during the life of the project.
Mid-market—an economic estimate of timber value at a point in time when half of the timber was harvested at a higher value and half was harvested at a lower value.
Present Net Value (PNV)—the difference between total discounted benefits and total discounted costs associated with the alternatives.

Introduction

When comparing the economic efficiency of alternative methods that produce similar results, economic analysis is useful. In the case of the Polk Inlet timber sale environmental analysis, each alternative represents a specific management strategy or emphasis to produce 88 to 119 MMBF of timber harvest. The Forest Service is legally mandated to consider a reasonable range of alternatives for accomplishing a specific project and to analyze the costs and benefits. The rationale in the decision to utilize scarce public natural resources requires balanced and thoughtful deliberation among management actions that affect the quality of the environment. Central to the analysis process is the concept of value, which is represented by the monetary value of the costs and benefits derived from using natural resources. In essence, the Forest Service manages a portfolio of public assets, and by selecting a specific course of action the Forest Service uses capital in the form of stumpage value or the value per acre of logs to help defray forest development expenses.

Southeast Alaska is unique because local citizens rely on the availability of natural resources from the Tongass National Forest. Their economic well-being and livelihood are inextricably tied to these resources. The Forest Service is required by the National Forest Management Act (NFMA 1976) regulations implementing NFMA, and Forest Service policy and manual direction to perform economic efficiency and economic equity or distributional analysis as part of the National Environmental Policy Act (NEPA) process. Economic efficiency is concerned with getting the most output for each dollar spent. Economic equity is concerned with who benefits (jobs, tax base) and who pays because of economic transactions. Forest Service officials are not required to select the alternative that is the most economically efficient. However, they must carefully consider the level of investment required to implement each project and alternative within projects to determine how to provide the outputs defined by the Forest Plan with the least expenditure of dollars. The purpose of this analysis is to provide the information needed to make informed economic decisions.

Economic Evaluation of Timber Harvest

The measure of economic efficiency applied in formulating and evaluating alternatives is Public Net Benefits (PNB) (36 CFR 219.1(a) and 219.12(f)). PNB are the sum of Present Net Value (PNV) and nonpriced commodity values. PNV is the difference between the discounted value of all outputs to which monetary values or established prices are assigned and the total

discounted costs of managing the area. Examples of nonpriced benefits include scenic quality, wildlife habitat, and community stability.

Direct and Indirect Effects

The economic impacts of the Polk Inlet Project Area alternatives can be evaluated in a number of ways. The value of the standing timber is equivalent to its "stumpage value," or the amount of compensation the Forest Service receives when the timber is harvested. In addition to returns to the U.S. Treasury, stumpage values indirectly affect fiscal conditions in local communities through payments to the State. The concept of PNV is useful in analyzing investments in timber harvest activities and capturing the benefits and costs that are realized over a period of time. The benefits of future harvest revenues are offset by their costs and combined with the costs and revenues of the initial harvest to calculate a PNV for each alternative. From a social welfare perspective, the volume of timber available for harvest under each alternative supports a different level of job opportunities in timber-related industries. A more detailed analysis of these important economic indicators is included in the following discussion.

Determining the economic feasibility of each timber sale offering is an important step in the Forest Service planning process. Forest Service policy and handbook direction (FSH 2409.18) requires an economic efficiency assessment to compare benefits and costs of each proposed timber sale project (a mid-market assessment) and to determine if the sale would be a positive economic offering. This economic efficiency analysis is performed by comparing expected gross revenues to estimated costs and arriving at an estimate of future net revenues. To account for market fluctuations, weighted average timber values over the past 10 years are used in the analysis.

Stump to truck logging costs vary by volume class (indices of the average quantity of timber per acre) mainly due to the size of the logs yarded. In general, the higher the volume per acre, the larger the logs; thus, the logging costs per thousand board feet (MBF) are lower. Species composition is an important variable to consider when estimating timber value. For example, Volume Class 4, which has the lowest average volume per acre, often contains a large proportion of yellowcedar that is exportable in log form and has high pond value. Pond value is the value of the logs at the mill, minus manufacturing costs. For the Polk Inlet Project, this assessment was conducted by subtracting estimated logging and transportation costs (including road construction) from the pond log value for each action alternative. Pond log values represent the delivered price of logs at the mill minus the cost to manufacture them into usable products. To account for market fluctuations, the weighted average of quarterly pond log values from 1979 through 1991 was used in the analysis. An allowance of 60 percent of normal profit and risk also was included as a cost and subtracted from pond log values per FSH 2409.18. This assessment, therefore, estimates the value of the timber that would accrue under average market conditions.

Mid-market Assessment

Table 4-63 displays the results of a mid-market assessment and the relative economic performance of each timber harvest alternative. It is important to recognize the limitations of the mid-market assessment approach; namely, the values represent very preliminary approximations of future timber sale revenues and costs. Prior to the time each geographic area within an alternative selected for implementation is offered, each unit and road will be cruised by the Forest Service to accurately determine the quantity, quality, and value of timber. A formal appraisal and timber sale report will be prepared incorporating current quarter selling values and cost information plus a normal profit and risk margin using the assumption of an operation

of average efficiency as required. Site-specific environmental investments, for example, reforestation of yellowcedar by hand planting in clearcut units, will be included in KV sale area improvement plans, timber sale appraisals, and contracts. The purpose of this appraisal is to determine the minimum acceptable selling value for the sale or offering. Current selling values have increased in response to market demand for Southeast Alaska logs; however, costs also have increased.

Table 4-63

Economic (Mid-market) Assessment of Timber Harvest (in Dollars per MBF)[1/]

	Alternative F2	Alternative 3	Alternative 4	Alternative F5
Total Volume (MBF)	107,615	119,544	119,075	87,233
Pond Log Value[2/]	321.62	322.12	316.69	322.13
Stump to Truck Costs[3/]				
- Method 1[4/]	131.41	136.31	120.30	129.13
- Method 2[5/]	143.61	151.78	124.44	140.05
Other Logging Costs[6/]	49.59	52.14	50.86	48.54
Road Construction Costs[7/]	59.79	73.70	68.33	63.37
Total Harvest Costs				
- Method 1[4/]	240.79	262.15	239.49	241.13
- Method 2[5/]	252.99	277.62	243.63	251.96
60% Profit Margin[8/]	41.30	39.96	39.47	41.00
Net Stumpage Value[9/]				
- Method 1[4/]	39.53	20.01	37.73	39.99
- Method 2[5/]	27.33	4.54	33.23	29.16

SOURCE: Greenstein 1993

1/ Figures represent volume weighted averages based on all geographic areas within each alternative.
2/ Pond Log Value = Projected Market Price - Manufacturing Costs.
3/ Includes falling, bucking, yarding, sorting, and loading costs.
4/ Method 1 assumes current Region 10 timber sale appraisal helicopter logging cost rates.
5/ Method 2 assumes that helicopter logging costs are $50 per MBF higher than current Region 10 timber sale appraisal rates.
6/ Includes haul, dump, raft, tow, road maintenance, administrative, and temporary development costs.
7/ Includes road construction, road reconstruction, and LTF construction costs.
8/ Includes 60% of normal profit and risk.
9/ Net Stumpage Value = Pond Log Value - Total Costs - 60% Profit Margin.

Examination of Table 4-63 shows that net stumpage values are highest for Alternative F5 with Alternatives F2 and 4 slightly lower and Alternative 3 ranking substantially lower, using cost estimating method 1. Method 2 results in a decrease in net stumpage especially for Alternatives F2, 3, and F5. Method 1 assumes the current Region 10 appraisal handbook costs for helicopter yarding reflect a reasonable estimate of actual costs. Method 2 was designed to respond to a common concern expressed by Forest Service and industry logging engineers that the appraisal cost estimates may underestimate actual helicopter logging costs because of limited transaction evidence of helicopter logging in Southeast Alaska. To analyze the effect of increased helicopter logging costs, an additional $50/MBF was added to Region 10 cost estimates to reflect cost sensitivity. Alternative 4, which uses helicopter logging for only 12 percent of total volume, outperformed all alternatives in terms of net stumpage with Method 2. This is interesting since Alternative 4 has the lowest pond log value and relatively high specified road construction costs; however, it has the lowest stump-to-truck costs.

Stump to truck costs include all cost centers used in the Region 10 appraisal process to harvest timber. Common to all alternatives are timber falling, bucking, yarding, sorting, and loading. A recent appraisal for the Twelvemile timber sale completed in the same geographic area as the Polk Inlet Project serves as an example of a sale where pond values less harvesting, transport, road development, and profit/loss costs produce a negative net stumpage value. The $321.44/MBF pond value less $297.99/MBF in logging and specified road costs plus $65.52/MBF for 60 percent of normal profit leaves a negative balance of $39.07/MBF for net stumpage. Long-term values have quarterly adjustments to reflect market conditions. The Forest Service uses the assumption of an operator of average efficiency to appraise timber sales. A more efficient operator could perform the sale and avoid a negative net stumpage. The Forest Service also recognizes that appraisals represent a photograph of a point in time and that changes in market demand can impact future sale offerings. Increased selling prices for forest products translate into improved pond values with the result that marginal stands, in terms of their economic operability, could be harvested at a profit. Comparing each alternative with the Twelvemile sale indicates that all alternatives are projected to yield significantly higher net stumpage values. In the case of the Twelvemile sale, the specified road cost of $95.27/MBF could not be supported by the value of the timber to be harvested. The negative stumpage value indicated could result in either establishment of ineffective purchaser credit, or the need for appropriated dollars to augment purchaser credits for road construction.

Variances in volume per acre, species mix, logging systems, log-haul distance, road construction and reconstruction costs, camp mobilization costs, and profit and risk allowances affect both the pond log values for each alternative and logging, transportation, and construction costs. Costs and revenues used in the assessment represent averages for each alternative. Although individual units, or even entire sales, may not be economical to harvest by themselves, the management of less productive lands or lands containing a high percentage of defective timber will help to increase future timber yields. The harvest of units with higher returns will help compensate for those that are less economical.

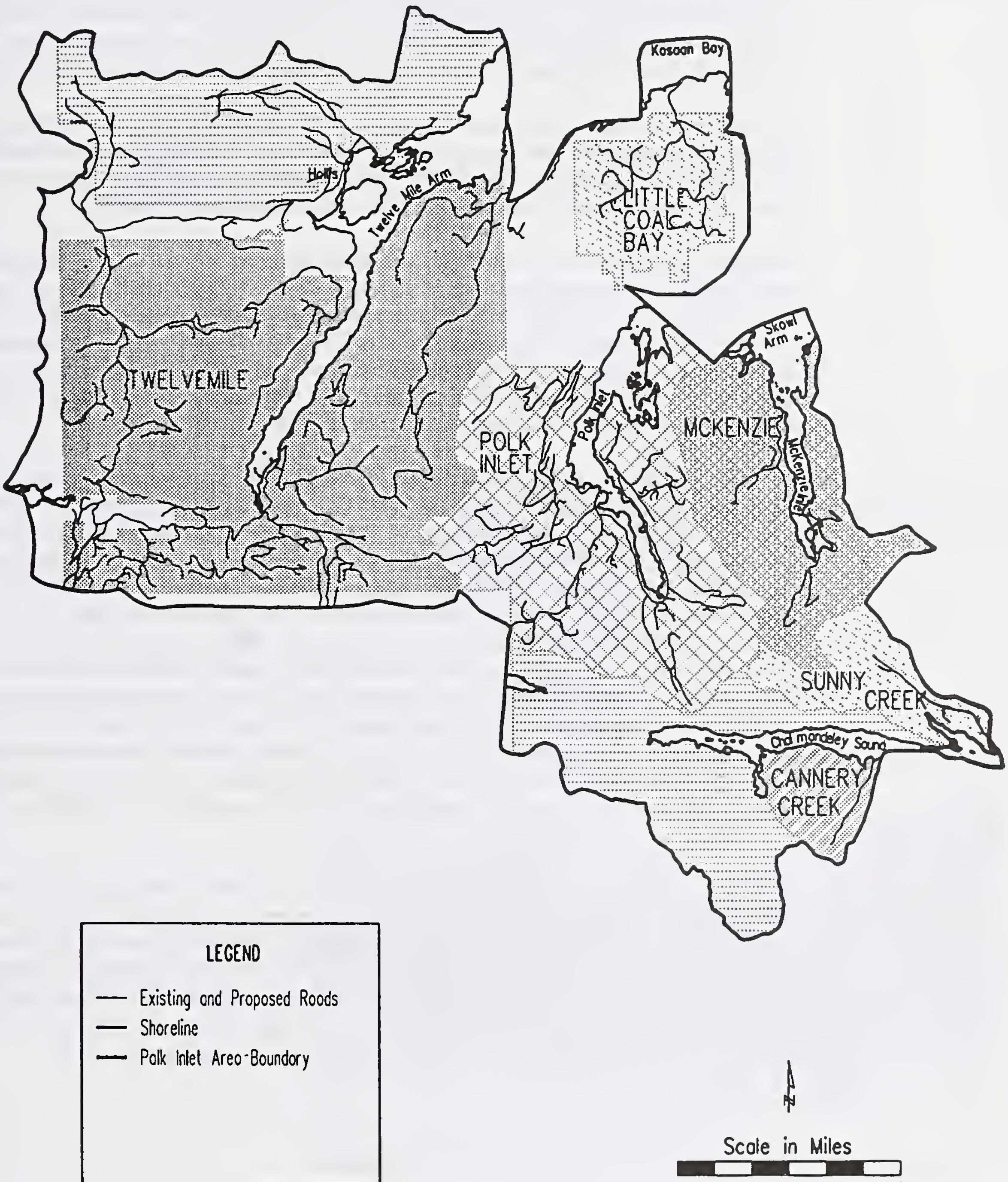
The major factors affecting net stumpage values among the action alternatives are transportation costs (hauling) and the cost of specified roads. Alternatives with longer average haul distances and more miles of road construction yield the lowest net stumpage values. Alternatives that concentrate harvest in VCU's with existing road systems propose shorter haul distances and require less road construction as well as yield higher net stumpage values. There is a direct relationship between the extent of helicopter yarding proposed for an alternative and increases in stump-to-truck costs. The cost increases, however, may be offset by lower costs for hauling and road construction costs.

Mid-market Results by Geographic Area

It is important to recognize that these analyses represent a relative appraisal not an absolute appraisal of future timber sales. As discussed in the previous section, a formal appraisal using current selling values and costs will be performed at the time of the sale. Analysis of timber harvesting opportunities by geographic or tributary areas should not be interpreted as timber sale offerings.

The harvest units in each alternative were assigned to 3 to 5 tributary areas based on the LTF to which the logs would be hauled. This produced 6 geographic areas identified as Twelvemile, Polk Inlet, Coal Bay, McKenzie, Sunny Creek, and Cannery Creek (Figure 4-26). In addition, a helicopter geographic area was included for each alternative which consisted of all helicopter harvest units in the Twelvemile and Polk Inlet geographic areas combined.

Figure 4-26
LTF Tributary Geographic Areas Used for Mid-Market Assessment



The results of the mid-market assessment and relative economic performance of each alternative by geographic area are presented in Table 4-64.

All four alternatives in aggregate have positive net stumpage values (see Table 4-64), meaning that the estimated selling price per thousand board feet of each alternative is expected to exceed their estimated combined logging and manufacturing costs. Selling prices (pond values) vary by less than 2 percent among all alternatives. The primary determinant in the differential of net stumpage value among the alternatives appears to be total harvest costs, primarily helicopter yarding costs and specified road costs. Differences among these costs are a function of different combinations of geographic areas and their respective harvest units per alternatives.

The purpose of the mid-market analysis is twofold. It is intended to increase the level of site specificity of the analysis, and assess the individual economic viability of each geographic area in context of the overall alternative. Each geographic area can produce different net stumpage values for each alternative because of differing compositions of harvest units.

Alternative F2 includes the Twelvemile, Polk Inlet, Helicopter, and Coal Bay geographic areas. The Coal Bay geographic area, with a -$30.82 net stumpage value, is an example of an area with low value timber ($294.83/MBF pond value), low volume per acre (19.6 MBF/ac), and expensive road development costs ($140.71/MBF) (Table 4-65). The economic viability of this geographic area depends on higher operator efficiency, lower road construction costs, or higher pond values than assumed in the mid-market assessment, unless stumpage values from other areas are used to subsidize this geographic area's costs.

Another alternative is under consideration for reducing harvest costs associated with this geographic area (see Chapter 2). The 1989-94 EIS includes LTF construction, road construction, and timber harvest in the Coal Bay area, which has not yet been implemented. Instead of implementing the 1989-94 construction and harvest followed by the Polk Inlet Coal Bay geographic area, both projects could be combined and LTF construction avoided by hauling timber to existing LTF's on Native Corporation land at Kina Cove and/or Smith Cove. Three options within this sub-alternative have been considered. One is to haul all timber to Kina Cove, northwest of the geographic area; one is to haul all timber southeast to Smith Cove; and one is to haul the timber in the west portion of the area to Kina Cove and that in the east portion to Smith Cove. Assuming a share cost agreement for road and LTF use could be worked out, this sub-alternative would trade LTF and road construction costs for LTF and road rental costs along with some road construction costs. Based on preliminary economic analysis and comparison, little cost difference exists between the original plan and the various options of this sub-alternative.

Using cost estimating method 2 for the Alternative F2 helicopter timber geographic area (which adds $50/MBF to yarding costs) produces a negative net stumpage value of -$2.42. The Forest Service is not permitted to sell timber below base rates; however, it is reasonable to say that this sale is likely to sell if offered to industry. By contrast, Polk Inlet timber geographic area produces a positive $60.47 net stumpage value, benefiting from high pond values ($327.19/MBF), lower total harvest costs ($227.21/MBF), and a smaller profit/risk ($39.51/MBF). See Table 4-65 for a detailed analysis of each geographic area.

Table 4-64

Net Stumpage Values by Geographic Area and Alternative Based on Two Methods[1/] (in Dollars per MBF)

Geographic Area	Cost Method	Alternative F2	Alternative 3	Alternative 4	Alternative F5
Twelvemile		34.82	12.33	30.95	38.76
Polk Inlet		60.47	3.98	70.40	64.82
Helicopter	(1)	47.58	44.84	26.03	44.63
	(2)	-2.42	-5.16	-23.97	-5.37
Coal Bay		-30.82	—	-30.82	-30.82
McKenzie	(1)	—	—		—
	(2)				—
Sunny Creek	(1)	—	-23.19	—	—
	(2)		-27.58		
Cannery Creek	(1)	—	—	22.47	—
	(2)	—	—	13.95	—
Total	(1)	39.53	20.01	37.73	39.99
	(2)	27.33	4.54	33.23	29.16

1/ For those geographic areas that include helicopter yarding, two methods were used to calculate net stumpage values. Method 1 results assume current Region 10 timber sale appraisal helicopter logging cost rates and Method 2 results assume that helicopter logging costs are $50 per MBF higher than current Region 10 timber sale appraisal rates.

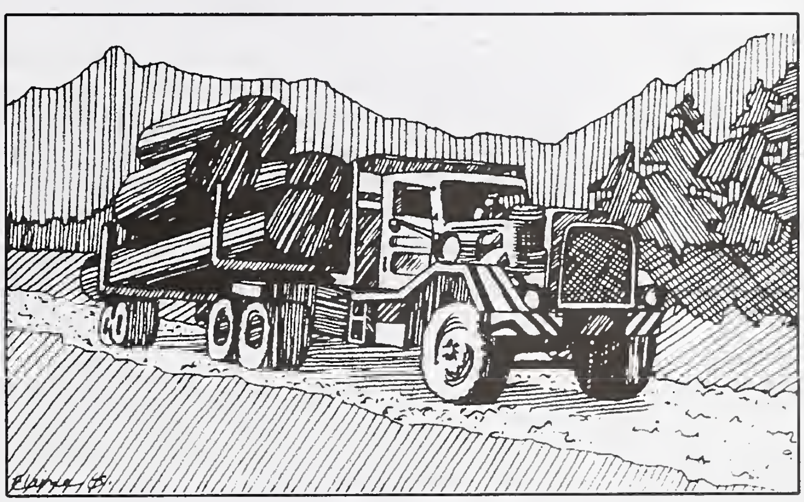


Table 4-65
Summary of Mid-market Analyses by Geographic Area for Alternative F2

	Twelvemile	Polk Inlet	Helicopter[1/]	Coal Bay
Total Volume (MBF)[2/]	39,812	31,754	26,256	9,793
Volume-Helicopter Yarded (MBF)	0	0	26,256	0
Vol./ac (MBF/ac)[2/]	26.7	28.0	25.6	19.6
Road Construction/Reconstruction (miles)	18.6	13.7	0	9.8
Pond Log Value ($/MBF)	320.71	327.19	326.27	294.83
Stump to Truck Costs ($/MBF)	122.78	110.28	178.91 (228.91)	107.66
Administration Costs ($/MBF)	8.00	8.00	8.00	8.00
Transportation Costs ($/MBF)	40.94	39.01	40.65	32.01
Temporary Development ($/MBF)	1.26	1.58	0.96	10.32
Road Development Costs ($/MBF)	72.50	68.33	0	140.71
Total Harvest Costs ($/MBF)	245.48	227.21	228.52 (278.52)	298.70
Conversion ($/MBF)[3/]	75.22	99.99	97.75 (47.75)	-3.87
60% Normal Profit & Risk($/MBF)	40.40	39.51	50.17	26.95
Net Stumpage Value($/MBF)	34.82	60.47	47.58 (-2.42)	-30.82

SOURCE: Greenstein 1993

1/ Numbers in parentheses are based on the assumption that helicopter logging costs are $50/MBF higher than current Region 10 timber sale appraisal rates.

2/ Includes volume in units and within road rights-of-way.

3/ Conversion = Pond Log Value - Total Harvest Costs.

Alternative 3 includes the Twelvemile, Polk Inlet, Helicopter, and Sunny Creek geographic areas. Similar to Alternative F2, the Helicopter geographic area has a negative net stumpage value of -$5.16 using cost estimating method 2. By contrast, the Sunny Creek timber geographic area with the higher timber value ($325.06/MBF) produces a negative net stumpage value of -$23.19 and -$27.58, respectively, using cost estimating methods 1 and 2. The expensive road development costs ($162.44/MBF), low volumes per acre (24.2/MBF/ac), and high temporary development costs ($18.76/MBF) combine to deprive this geographic area of a positive net stumpage. See Table 4-66 for a detailed analysis of each timber geographic area.

Table 4-66
Summary of Mid-market Analyses by Geographic Area for Alternative 3

	Twelvemile	Polk Inlet	Helicopter[1/]	Sunny Creek[1/]
Total Volume (MBF)[2/]	68,285	9,356	36,520	5,383
Volume-Helicopter Yarded (MBF)	0	0	36,520	470
Vol./ac (MBF/ac)[2/]	25.9	19.4	21.1	24.2
Road Construction/Reconstruction (miles)	46.9	6.8	0	5.3
Pond Log Value ($/MBF)	324.24	314.43	319.69	325.06
Stump to Truck Costs ($/MBF)	120.62	115.28	176.34	100.32
			(226.34)	(104.69)
Administration Costs ($/MBF)	8.00	8.00	8.00	8.00
Transportation Costs ($/MBF)	45.25	32.74	41.01	29.14
Temporary Development ($/MBF)	0.73	5.37	0.69	18.76
Road Development Costs ($/MBF)	101.04	110.73	0	162.44
Total Harvest Costs ($/MBF)	275.64	272.12	226.04	318.65
			(276.04)	(323.03)
Conversion ($/MBF)[3/]	48.59	42.31	93.65	6.41
			(43.65)	(2.03)
60% Normal Profit & Risk ($/MBF)	36.26	38.33	48.81	29.61
Net Stumpage Value ($/MBF)	12.33	3.98	44.84	-23.19
			(-5.16)	(-27.58)

SOURCE: Greenstein 1993

1/ Numbers in parentheses are based on the assumption that helicopter logging costs are $50/MBF higher than current Region 10 timber sale appraisal rates.

2/ Includes volume in units and within road rights-of-way.

3/ Conversion = Pond Log Value - Total Harvest Costs.

Alternative 4 includes the Twelvemile, Polk Inlet, Helicopter, Coal Bay, McKenzie and Cannery Creek geographic areas. Similar to Alternative 1, the Coal Bay geographic area has a negative net stumpage value of -$30.82/MBF. Polk Inlet and McKenzie geographic areas have positive net stumpage values of $70.40 and $75.72, respectively, using cost estimating method 1. The Helicopter geographic area produces a net stumpage value of $26.03/MBF and -$23.97/MBF, using cost estimating methods 1 and 2, respectively. See Table 4-67 for a detailed analysis of the geographic areas in Alternative 4.

Table 4-67

Summary of Mid-market Analyses by Geographic Area for Alternative 4

	Twelve-mile	Polk Inlet	Heli-copter[1/]	Coal Bay	Cannery Creek[1/]	McKenzie[1/]
Total Volume (MBF)[2/]	57,274	30,364	9,858	9,793	4,979	6,807
Volume-Helicopter Yarded (MBF)	0	0	9,858	0	848	3,061
Vol./ac (MBF/ac)	27.1	30.5	29.4	19.6	32.5	38.4
Road Construction/ Reconstruction (miles)	33.3	10.7	0	9.8	1.6	1.8
Pond Log Value ($/MBF)	320.66	323.15	300.16	294.83	280.42	336.46
Stump to Truck Costs ($/MBF)	121.55	108.33	174.19 (224.19)	107.66	97.37	120.09
Administration Costs ($/MBF)	8.00	8.00	8.00	8.00	8.00	8.00
Transportation Costs ($/MBF)	43.20	38.97	39.63	32.01	26.45	26.97
Temporary Development ($/MBF)	0.87	1.65	2.54	10.32	20.07	14.70
Road Development Costs ($/MBF)	77.63	54.77	0	140.71	61.65	50.29
Total Harvest Costs ($/MBF)	251.26	211.72	224.37 (274.37)	298.70	213.54 (222.06)	220.05 (242.53)
Conversion ($/MBF)[3/]	69.39	111.43	75.80 (25.80)	-3.87	66.88 (58.36)	116.41 (93.93)
60% Normal Profit & Risk ($/MBF)	38.44	41.03	49.77	26.95	44.41	40.69
Net Stumpage Value ($/MBF)	30.95	70.40	26.03 (-23.97)	-30.82	22.47 (13.95)	75.75 (53.24)

SOURCE: Greenstein 1993

1/ Numbers in parentheses are based on the assumption that helicopter logging costs are $50/MBF higher than current Region 10 timber sale appraisal rates.

2/ Includes volume in units and within road rights-of-way.

3/ Conversion = Pond Log Value - Total Harvest Costs.

Alternative F5 includes the Twelvemile, Polk Inlet, Helicopter, and Coal Bay, timber geographic areas. Using cost estimating method 1, all geographic areas except Coal Bay have positive net stumpage values. The Helicopter geographic area has a slightly negative net stumpage value of -$5.37/MBF using cost estimating method 2. See Table 4-68 for a detailed analysis of each geographic area.

Table 4-68
Summary of Mid-market Analyses by Geographic Area for Alternative F5

	Twelvemile	Polk Inlet	Helicopter[1/]	Coal Bay[1/]
Total Volume (MBF)[2/]	32,518	26,019	18,903	9,793
Volume-Helicopter Yarded (MBF)	0	0	18,903	0
Vol./ac (MBF/ac)	25.2	26.6	23.6	19.6
Road Construction/ Reconstruction (miles)	16.3	10.3	0	9.8
Pond Log Value ($/MBF)	325.25	326.51	324.86	294.83
Stump to Truck Costs ($/MBF)	121.26	109.85	180.71 (230.71)	107.66
Administration Costs ($/MBF)	8.00	8.00	8.00	8.00
Transportation Costs ($/MBF)	38.14	39.01	39.21	32.01
Temporary Development ($/MBF)	1.54	1.93	1.33	10.32
Road Development Costs ($/MBF)	77.32	62.88	0	140.71
Total Harvest Costs ($/MBF)	246.27	221.68	229.25 (279.25)	298.70
Conversion ($/MBF)[3/]	78.99	105.85	95.61 (45.61)	-3.87
60% Normal Profit & Risk ($/MBF)	40.23	40.01	50.98	26.95
Net Stumpage Value ($/MBF)	38.76	64.82	44.63 (-5.37)	-30.82

SOURCE: Greenstein 1993

1/ Numbers in parentheses are based on the assumption that helicopter logging costs are $50/MBF higher than current Region 10 timber sale appraisal rates.

2/ Includes volume in units and within road rights-of-way.

3/ Conversion = Pond Log Value - Total Harvest Costs.

Conclusion

All Alternatives yield positive net stumpage values regardless of cost estimating method as indicated in Table 4-64. Comparing geographic areas across the range of alternatives provides some insight into their contribution to net stumpage. As indicated in Tables 4-65 to 4-68, each geographic area represents a different mix of units and access roads so they are not identical across the range of alternatives.

Net stumpage values which are positive indicate a probable viable offering while areas with negative values may sell if offered to industry. However, it is important to recognize that these values represent preliminary approximations based on mid-market not current or future values. Prior to the time that timber is made available to industry, a timber cruise and appraisal will be

conducted using current selling values, costs, and normal (100 percent) profit and risk, which will allow for the determination of the volume and value of timber available for harvest.

The helicopter geographic area is positive across all alternatives using cost method 1 and negative under all alternatives using cost method 2. However, only in Alternative 4 at -$23.97/MBF is the area unlikely to sell by itself since the other alternatives are only slightly deficit. The Coal Bay area is deficit at -$30.82/MBF in all alternatives and is unlikely to sell if offered alone. Sunny Creek, which is only included in Alternative 3, is deficit at -$23.19/MBF and -$27.58/MBF using cost methods 1 and 2, respectively, and is not likely to sell if offered alone.

Coal Bay and Sunny Creek are substantially deficit and represent a risk from the standpoint of not selling if offered without being combined with other areas. Most areas would be likely to sell if offered to industry at base rates. An increase in timber value could improve geographic area viability. Other remedies the Forest Service may consider to improve overall sale economics include pre-roading areas with appropriated funds or changing road design standards. For example, it is possible to maintain basic road geometry by rolling grades to minimize excavation, thus reducing the amount of surface rock and the size to reduce costs. Active road management using gates or other devices to restrict access during harvesting and hauling operations would allow operators to meet industrial safety objectives when operating on these collector roads. Gates could also be used to minimize the need for annual maintenance. Lower traffic service levels would require less capital investment and increase net stumpage in marginal areas.

Economic Efficiency: Public Investment Analysis

Public investment analysis allows Forest Service administrators to make valid economic comparison among mutually exclusive alternatives. PNV is calculated for each alternative to display relative economic efficiency. PNV is useful in identifying the best alternative among several that essentially accomplish the same objective. The alternative with the highest PNV provides the greatest return for a comparable level of investment.

Unfortunately, investment analysis is based on the assumption that estimated revenues for an alternative will actually occur. To accurately predict PNV and avoid overstating the level of benefits or revenue associated with each alternative economic analysis must incorporate risk or the probability that certain events or outcomes will occur. The degree of risk is a function of a historical loss or falldown associated with similar projects. For example, the estimated biological yield for a fully stocked timber stand reforested following initial harvest may never be realized due to future losses from insects, disease, or shifts in species composition. Adjustment must be made to factor in these risks and falldown.

Public investment analysis of the timber harvest alternatives incorporates the concept of the time value of money. Present-day costs and management expenses are subtracted from net stumpage revenues (stumpage receipts obtained from the mid-market analysis). Indirect costs include planning, sale preparation, harvest administration, reforestation, timber standard improvement, general and program administration, facilities depreciation, and regional land line location.

Preliminary estimates of costs indicate that they will exceed timber sale revenues for Alternatives 3 and F5 using cost estimating method 1 (Table 4-69). Alternative 4 is the most efficient. All alternatives have negative PNV's using cost estimating method 2. Alternative 4 is again the most economically efficient. The net revenues from harvesting existing timber standards are expected to be less than the returns from future harvests. This conclusion is

based on the assumption that a large portion of the costs incurred today will provide infrastructure improvements to support future timber harvests. Cost and revenue estimates have been calculated and summarized into a PNV for each alternative, using cost estimating methods 1 and 2, to evaluate the effects of the proposed timber harvest on the overall financial efficiency of the project proposal. Cost and revenues incurred in the future are discounted back to the present to capture the timber value of money.

Socioeconomic Analysis

As part of a long-term cooperative effort among the Federal government, the State of Alaska, and local municipalities to provide greater economic diversity in Southeast Alaska, the Tongass Timber Management Program was developed. Timber harvested in National Forests is subject to domestic processing requirements. Therefore, most of the jobs provided by the pulp mills and sawmills in the region are linked to timber supplies from the Tongass. Maintaining timber supply opportunities for the region's timber industry was an important objective of both the TLMP and ANILCA. Employment in logging, lumber, and pulp production in Southeast Alaska increased by 30 percent between FY 1981 and FY 1990 (ANILCA 706(a) Report to Congress, Region 10 Forest Service 1990c).

However, the maintenance of ANILCA's timber employment objectives is dependent on other factors. Interest rates, production and shipping costs, regional competition, private and public harvest levels, foreign exchange rates, and the overall Pacific Rim demand for wood fiber also impact employment levels in the timber industry.

Table 4-69
Public Investment Table[1/]

	Alternative F2	Alternative 3	Alternative 4	Alternative F5
Net Stumpage Value				
Cost Method 1	$39.53	$20.01	$37.73	$39.99
Cost Method 2	$27.33	$4.54	$33.23	$29.16
Total Volume	107,615 MBF	119,544 MBF	119,075 MBF	87,233 MBF
Total Stumpage Receipts				
Cost Method 1	$4,254,021	$2,392,075	$4,492,700	$3,488,448
Cost Method 2	$2,941,118	$542,730	$3,956,862	$2,543,714
Forest Service Costs	$4,233,450	$5,138,952	$4,332,822	$3,578,406
Present Net Value (PNV)				
Cost Method 1	$20,571	-$2,746,877	$159,878	-$89,958
Cost Method 2	-$1,292,332	-$4,596,222	-$375,960	-$1,034,692

SOURCE: Greenstein 1993.

1/ Forest Service costs include sale preparation, timber planning, silvicultural exams, harvest administration, general and program administration, facilities depreciation, and regional land line location. They are based on the Timber Sale Program Information Reporting System (TSPIRS) for FY1991 for the Ketchikan Area.

Types of Economic Effects

Under all project alternatives except for the No-Action Alternative, the regional economy will be stimulated as a result of project related expenditures, payroll expenditures, and related indirect and induced spending, or "multiplier effects." In assessing the economic impacts of the project, it is important to recognize that because of methodology, regional economic impacts associated with this project are measured as if they take place in one phase. However, reality dictates that these impacts actually take place along two primary phases. The initial phase of the project is likely to result in a higher level of expenditures, primarily for infrastructure upgrades (roads, etc.). These higher expenditures are likely to result in a temporary increase in the level of local economic activity. However, since these expenditures are by nature short-term, their impact on the regional economy will be limited. Economic activity generated during the second phase of the project, the routine harvesting of designated areas, will continue throughout the life of the project. Therefore, while from a public investment perspective, initial project outlays result in higher Forest Service costs and therefore, a lower PNV, from a socioeconomic perspective these additional expenditures may result in a higher infusion of cash into the local economy, creating additional demand resulting in an increased level of local economic activity.

Long-term economic impacts may further affect the demographic characteristics of the area, with resultant minor impacts on the local housing market and various community services.

Methodology

Multipliers generated by the Forest Service's economic model, IMPLAN, were used to provide estimates of levels of employment and income which would be supported by each of the proposed timber harvest alternatives within the Polk Inlet Project Area. The economic effect of any alternative is composed of primary or direct effects, and secondary or indirect and induced effects. Direct effects are measured primarily as increases in employment and income within the wood product industry (including harvesting, construction, logging, transportation, processing, and sawmill operations) resulting from any changes in production levels. This methodology is based on the assumption that any increase in production is in response to an increase in market demand. Indirect and induced effects, here on to be referred to as indirect effects, are an economic by-product of increased expenditures (increased demand) for goods and services on the part of industries directly involved in timber harvesting, as well as the additional wage earners employed in timber harvesting and production. For example, sawmills require electricity, mechanical components, and miscellaneous supplies to meet the demand for lumber. Some of these necessities will be purchased locally. The providers of those services and supplies will, in turn, increase their consumption of goods and services, thus creating additional rounds of expenditures. Further economic stimulus is created when wages from the direct and indirect employment effects are spent within the project region. Multipliers generated by IMPLAN capture all rounds of spending and response generated through increases in industrial and individual consumption.

The IMPLAN model, like other regional economic input-output models, serves as a proxy for the actual economic structure of a region. The foremost assumption of an input-output model, such as IMPLAN, is that the production function of local industries remains constant over time. Therefore, the ratio of employment to output is held constant, allowing for derivation of changes in direct employment based on estimates of changes in total industry output. Due to increased efficiency in the timber industry over the past few years, the share of labor as a production input is less. To represent as realistically as possible all potential economic impacts, the IMPLAN model has been adjusted accordingly. It now incorporates employment and output information that is more representative of current industry structure.

A variety of industries comprise what is commonly referred to as the "wood products industry." For purposes of this analysis, a distinction is made between employment attributed to timber harvest and the employment supported by processing of that timber into lumber, cants, and pulp. This distinction is important in terms of the timing of employment opportunities and the availability of other sources of fiber. For several reasons, the consequences of the proposed action are more directly reflected in the employment figures corresponding to timber harvest activities rather than those of the processing industries. Although the Project Area is one source of supply for the mills, a number of previously mentioned factors influence the amount of pulp and lumber produced, as well as the potential of additional fiber supplies. Finally, employment figures reported here represent a portion of the current work force rather than an absolute increase in employment. Consequently, they are most appropriately used for comparison between alternatives.

Impact Analysis and Review—Employment and Income Effects

Table 4-70 lists the results derived from the IMPLAN model analysis for each alternative. Employment and income effects for timber harvesting activities are based on the detailed estimates of logging and road construction costs used in the economic assessment previously discussed. Historical trends were used as determinants in the percentage distribution of stumpage volume to be allocated between pulp and lumber production. This distribution, in turn, impacts projected employment and income effects associated with timber processing. Personal income estimates are based on average industry wages as reported by the timber industry and the Alaska Department of Labor.

Table 4-70
Socioeconomic Table—Total Employment and Income Effects

	Alternative F2		Alternative 3		Alternative 4		Alternative F5	
	Emp[1/]	Inc[2/]	Emp	Inc	Emp	Inc	Emp	Inc
Timber Harvesting								
Logging[3/]	328	11.3	386	13.3	327	11.2	259	8.9
Construction	45	1.7	61	2.3	56	2.2	38	1.5
Marine Transport	9	0.9	10	1.0	9	0.9	7	0.7
Subtotal	382	13.9	457	16.6	392	14.3	304	11.1
Timber Processing								
Sawmills	145	5.3	161	5.9	160	5.8	117	4.3
Pulpmills	298	12.8	331	14.3	330	14.2	242	10.4
Subtotal	443	18.1	492	20.2	490	20.0	359	14.7
Total	825	32.0	949	36.8	882	34.3	663	25.8

SOURCE: Greenstein 1993.

1/ Emp = Employment (person-years)
2/ Inc = Direct Income ($ million)
3/ Calculated using cost estimating method 2.

These site-specific data were incorporated into the IMPLAN model to calculate the total effect of increased timber-related output in the construction, logging, sawmill, and pulp mill industries within Southeast Alaska.

Employment opportunities closely parallel the level of timber harvest coupled with associated local expenditures. Therefore, Alternative 3 produces the highest impacts, since local costs associated with its implementation are highest among the alternatives. Overall, volumes among the alternatives are comparable because they provide industry with an offering that would maintain contract volume obligations. As a result, the annual harvest and annual mill production for each of these alternatives would be expected to remain relatively constant and would not have a significant effect on the timber industry or its dependent employment and income.

Total direct employment supported under each alternative has been broken down into two major categories, timber harvesting and timber processing. Overall, timber processing is expected to support between 50 and 60 percent of direct employment generated. In terms of overall direct employment, Alternative 3 is expected to generate the largest number of direct person-years of employment while Alternative F5 is expected to generate the least.

Under the assumption that implementation of the Alternative 1 would eliminate the proposed harvest volume within the ROI and of the latter employment opportunities, selection of the Alternative 1 would cause a significant impact to the economic base of communities dependent on timber harvesting on Prince of Wales Island and timber processing at the KPC. Alternative 1a would result in a greater impact due to the greater harvest volume that would be foregone.

Impact Analysis and Review—Fiscal Effects

To help the public understand timber management, the Forest Service initiated the Timber Sale Program Information Reporting System (TSPIRS), which is intended to improve the way information is developed and displayed. The TSPIRS presents three reports on the national forest timber program for the year. The three reports are 1) The Financial Report; 2) The Economic Report; and 3) The Employment, Income, and Program Report. The TSPIRS is produced and made available to the public annually.

Although it is not possible to accurately determine timber sale revenues to the Federal government, pond log values net of specified road and logging costs can be used as basis for an approximation. Moreover, it is estimated that 25 percent of gross National Forest receipts go to the State of Alaska and are returned to local areas with distribution based on a percent of the National Forest in an area.

As indicated in Tables 4-71 and 4-72, Alternative 4 is expected to produce the largest receipts to the State of Alaska and the Ketchikan Area while Alternatives F2, 3, and F5 would yield lower receipts. Implementation of Alternatives 1 or 1a would result in both negative economic and fiscal impacts with the greatest impacts under Alternative 1a. Not only would direct and indirect employment opportunities be eliminated, but tax receipts generated from increased employment would also be eliminated. No new jobs would be created, resulting in the loss of additional tax revenues, and those currently employed in industries directly or indirectly related to timber harvesting and processing could lose their jobs. This would decrease tax receipts and lead to a higher burden on the State for unemployment compensation. Implementation of Alternatives 1 or 1a may detrimentally affect the regional economy. Overall, fiscal and socioeconomic impacts are not meant to serve as indicators of alternative preference. Rather, they are indicators of peripheral economic implications associated with each alternative.

Table 4-71
Socioeconomic Table—Estimated Payments to State of Alaska (by Alternative)

	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Total Volume (MBF)	107,615	119,544	119,075	87,233
Net Stumpage Value[1/]	27.33	4.54	33.23	29.16
Road Construction Costs[2/]	59.79	73.70	68.33	63.37
Sum of Net Stumpage Value + Road Costs	87.12	78.24	101.56	92.53
Less $0.50/MBF to Treasury[3/]	86.62	77.74	101.06	92.03
Times MBF	9,321,611	9,293,351	12,033,720	8,028,053
25 Percent to State[4/]	2,330,403	2,323,338	3,008,430	2,007,013

SOURCE: Greenstein 1993.

1/ Cost estimating method 2 was used, which assumes that helicopter logging costs are $50/MBF higher than current Region 10 timber sale appraisal rates.
2/ Includes road construction, road reconstruction, and LTF construction costs.
3/ $0.50/MBF is the minimum payment to the U.S. Treasury.
4/ National Forest Receipts Act payments (25% of net stumpage value plus the value of capital improvements such as purchaser credit for roads, LTF's, and timber stand improvements) to the State of Alaska.

Table 4-72

Socioeconomic Table—Employment Effects and Estimated Return to the State and Ketchikan from Federal Income Taxes Derived from Project-produced Personal Income

	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Employment Effects				
Direct Jobs	825	949	882	663
Indirect Jobs	353	406	377	284
Total Jobs	1,178	1,355	1,259	947
Fiscal Effects (In Millions)				
Total Personal Income	42.4	48.8	45.3	34.1
Federal Income Tax	8.1	9.3	8.6	6.5
25% Transfer to State from Federal Income Tax 1/ (Estimated)	2.0	2.3	2.2	1.6
Payment to Ketchikan (4.5% of total State receipts - estimated)	0.1	0.1	0.1	0.1

SOURCE: Greenstein 1993.

1/ This percentage of personal income taxes paid to the federal government has been returned on average to the State. This amount does not include the 25 percent of gross federal receipts returned from the Forest Service to the State of Alaska.

Localized Economic Implications

The predictive capabilities of the IMPLAN model are based on linear relationships. Regardless of the size or direction of change in timber harvest levels, the model assumes that the regional economy is expected to respond in a strictly proportional manner. In reality, this straight-line relationship may not hold, and some industries may be forced to shut down completely if production is significantly reduced. The extensive capital investment in a pulp mill represents a fixed cost that cannot be altered in the short run. To remain economically viable, the plant must run continuously at a reasonable operating level to cover fixed and variable costs. Conversely, if large increases in demand occur, an industry may expand operations with additional capital investment to purchase more efficient technology. New technology usually requires only a limited increase in employment. So the estimates of employment and income derived from IMPLAN must be interpreted with regard to the scale and operating capacity of industries within the ROI.

The same logic applies to the assessment of economic impacts to the various towns and communities of Prince of Wales Island and Ketchikan. Implementation of Alternatives F2, 3, 4 or F5 represent a continuation of ongoing economic activity. While implementation of any of these alternatives is expected to result in the previously cited economic and fiscal benefits, these benefits are not expected to alter ongoing local and regional expenditure patterns. Implementation of the Alternatives 1 or 1a, (i.e., elimination of harvesting of volume proposed for the Polk Inlet Project), may have adverse economic impacts on the regional economy. Implementation of this alternative may result in adverse impacts on various communities on Prince of Wales Island, primarily those that provide an alternative source for some goods and services.

Community Stability and Lifestyles

In addition to changes in employment and income, implementation of each of the alternatives will affect other elements of community and individual stability and lifestyles. Elements associated with community and individual stability in this context, reflect the visual and recreational value of the Project Area and surrounding region, wildlife habitat, and subsistence resources. Detailed discussions of the respective impacts on these resources are presented in corresponding sections of this document.

Community stability is a very important consideration in planning for timber harvest activities on the Tongass National Forest. In addition to values described in preceding discussions (e.g., employment, income, tax receipts), a balance between natural and human resource activities is important to the communities of Southeast Alaska. Many of the residents of Southeast Alaska derive their livelihood from the timber industry or benefit from the economic development the timber industry has brought to their communities. Many residents also participate in a wide variety of activities dependent on the National Forest and/or reside in Southeast Alaska because of its natural setting. As a result, a balance between economic development and an emphasis on noncommodity resources is a desirable objective.

Implementation of Alternatives 1 or 1a may result in substantial cutbacks in the industry's production. The corresponding decrease in timber harvesting and processing employment and income would negatively affect community stability.

Implementation of Alternatives F2, 3, 4 or F5 would maintain a relatively high level of timber harvesting through the Polk Inlet Project implementation period. In general, they would disperse management activities and tend to bring those areas that have not yet been developed under active timber management within the Project Area. This may have a negative effect on use of the area by people who desire a more natural setting for recreation, subsistence, and other activities. In general, the action alternatives are similar in terms of the level of intensive timber management and their opportunities for noncommodity use. Therefore, differences among the alternatives in terms of projected impacts on lifestyles and community stability would be minimal. However, because of the proximity and visibility of harvest activities to the community of Hollis under Alternative 3, this alternative could have a greater effect on Hollis residents' lifestyles. Similarly, Alternative 3 could affect residents of Sunny Cove and Alternative 4 could affect residents near the mouth of Cannery Creek due to the proximity and visibility of harvest activities.

Sectoral Economic Effects

Commercial Fishing Industry

As noted in the *Water, Fish, and Fisheries* section of this chapter, no measurable effects on fisheries resources are expected under the action alternatives since habitat is protected as required to meet the standards and guidelines of the TLMP, TTRA, and NFMA. Therefore, implementation of any of the alternatives would not affect the commercial fishing industry.

Recreation and Tourism Industry

Future employment in the recreation and tourism industries, including employment related to sport hunting and fishing, is projected to change at the same rate as future use. Projected future recreational use demand in Southeast Alaska during the 1990's is expected to increase by 27 percent for recreation and tourism, 36 percent for sport fishing, and 53 percent for hunting (Forest Service 1990). Projected future increases in recreation and tourism related

employment in Southeast Alaska are expected to correspond to increases in recreation demand. Implementation of any of the proposed alternative actions in the Polk Inlet Project Area are not expected to significantly impact or be impacted by this regional trend.

Jobs and earnings related to expenditures made by deer hunters and salmon anglers are widely dispersed across Southeast Alaska. Hunters and anglers use towns within the Economic Region of Influence (ROI - defined in Chapter 3) to replenish their groceries, gasoline and other supplies. However, most expenditures for equipment and initial supplies are made in their home communities. Similarly, the employment and personal income generated by other recreational users of the Polk Inlet Project Area are dispersed across Southeast Alaska and throughout a variety of economic sectors. These people include individual recreationists, outfitter-guides and their clients, and tourists viewing the Project Area from cruise boats or from the Alaska Marine Highway ferry system.

Gilnet commercial fishing

Because of the estimated comparatively low level of recreational activity that takes place in the Polk Inlet Project Area, and because the alternatives would not significantly affect many recreation places and sites, no significant impact is expected on employment and income opportunities in the recreation and tourism industry. Implementation of any of the action alternatives (F2, 3, 4 or F5) may result in the displacement of some recreational users to areas outside the Project Area. This displacement would be a result of recreationists seeking specific primitive or semiprimitive recreational opportunities that might no longer be available in the area of active timber harvest or road construction. As more areas are harvested for timber, displaced recreationists seeking primitive or semiprimitive recreational opportunities would find it increasingly difficult to find places for recreation on Prince of Wales Island. However, this displacement would not be expected to significantly change employment or income.

Cumulative Effects

The cumulative effects of each of the alternatives on the economic and social environment are difficult to estimate. A wide variety of factors affect employment and income levels, tax receipts, demographic characteristics, lifestyles, and community stability within the Southeast Alaska region. The cumulative effects associated with the proposed timber harvesting alternatives in the Polk Inlet Project Area on the reasonably foreseeable and longer term future of Prince of Wales Island and its surrounding area are expected to take place along three primary aspects.

The first aspect relates to the economic viability of the next entry into the Polk Inlet Project Area. The economic feasibility of helicopter yarding is more greatly affected by market values than cable yarding. Alternative 3 proposes the largest proportion of area for helicopter yarding, 37 percent, while Alternative 4 proposes the least, 12 percent (Table 4-32). Alternatives F2 and F5 are intermediate with 28 and 24 percent, respectively.

The ground-verified unit pool of 158 potential harvest units included 2,349 acres proposed for helicopter yarding out of a total of 6,728 acres or 35 percent. Most of the next entry into the Project Area would include the remainder of the ground-verified unit pool, not harvested under the Polk Inlet Project. This would occur because most of the other suitable-available CFL would still need to be deferred due to adjacency, cumulative visual and watershed effects, and other factors.

Table 4-73 shows the acreage remaining in the ground-verified unit pool after Polk Inlet Project harvest by yarding method for the action alternatives. Helicopter yarding would be required for 68 percent of the remaining unit pool acreage under Alternative 4 and 47 percent under Alternatives F2 and F5. Alternative 3 would require helicopter yarding for 33 percent and 34 percent of the remaining acreage, respectively. Although some additional cable yarding units would become available for harvest prior to the next entry, it is apparent that the economic viability of this entry could be compromised under Alternative 4.

Table 4-73

Acreage Remaining After Polk Inlet Project Harvest by Yarding Method for Each Alternative

			Remaining After Polk Inlet Project Harvest							
Yarding	Unit Pool		Alt. F2		Alt. 3		Alt. 4		Alt. F5	
Method	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Cable Yarding	4,379	65	1,542	53	1,428	67	923	32	1,890	53
Helicopter Yarding	2,349	35	1,342	47	703	33	1,979	68	1,647	47
Total	6,728		2,884		2,131		2,902		3,537	

The second aspect relates to the economic and social benefits of continued harvesting of the proposed volume on Prince of Wales Island. From the standpoint of employment, personal income, population, community services, and some aspects of community stability, there is substantial benefit from maintaining long-term timber harvest in the contract area. The receipts generated, including revenue to the U.S. Treasury, payments to the State of Alaska, State and local taxes, and dollars brought into the community, all represent an economic benefit from continued timber activity.

Based on the timber supply analysis (see *Timber and Vegetation*) it is unlikely that enough timber is available within the Polk Inlet Project Area and on Prince of Wales Island to sustain the scheduled timber harvest through the end of the first rotation (Year 2054) when second growth would become widely available for harvest, unless timber values increase and/or improved or more efficient logging systems are developed to make economically marginal timber marketable. If these factors do not improve, the scheduled harvest could be reduced by about 18 percent over the next 6 decades. The fact that fluctuations in scheduled timber harvest from decade to decade are generally much greater than 18 percent would dampen the effect of this reduction. This analysis is based on the assumption that Alternative P in the Supplement to the TLMP Draft Revision will be implemented.

The timber supply analysis also speculates on potential changes in timber supply associated with potential changes in land uses and reductions in clearcutting. The potential change categories included old-growth habitat (30%), karst (40%), and reduced clearcutting (10%), with a net estimated percentage of 30 percent. Table 4-73a displays results of falldown and changes in timber supply if all expected and speculated categories were to occur.

Table 4-73a

Projected Potential Cumulative Falldown for South-Central Road System

Decade	Scheduled Harvest Under TLMP (Alt. P) Acres	Volume	Sales[3/]	Projected Harvest After Falldown[1/] Acres	Volume	Sales	Potential Additional Falldown due to Economics[2/] Acres	Volume	Sales
1995-2004	6,481	175	18	4,083	110	11	857	23	2
2005-2014	8,136	220	22	5,126	139	14	1,076	29	3
2015-1024	7,024	190	19	4,425	120	12	929	25	3
2025-2034	12,000	324	32	7,560	204	20	1,588	43	4
2035-2044	21,188	572	57	13,348	360	36	2,803	76	8
2045-2054	7,832	211	21	4,934	133	13	1,036	28	3
Total Harvest	62,661	1,692	169	39,476	1,066	106	8,289	224	23

Traditional Level of Harvest 6,500 acres[4/]

1/ Reduces TLMP Alt. P by 30% for potential falldown due to land use changes and reduction in clearcutting and an additional 10% for suitability factors (Forest Service 1992i, The Irland Group 1991).

2/ Identifies 21% of the Project Harvest After Falldown figures associated with economic factors as identified in Forest Service (1992i) and The Irland Group (1991).

3/ Assume average sale or offering size is 10 MMBF.

4/ Harvest level was approximately 10,000 acres from 1965-1974, 1,500 acres from 1975-1984, and 7,500 acres projected 1985-1994.

Localized Economic Implications

Information in Table 4-73a indicates that in the first decade (1995-2004) the number of sales (or offerings) could be reduced from 18 to 11 with 2 of the 11 being at risk of falldown due to poor economics. Similarly, the second decade (2005-2014) shows a reduction from 22 sales to 14 with 3 sales at risk of economic related falldown.

In relation to the TLMP (Alt. P) scheduled harvest it would take less logging and facility construction operations to accomplish the 11 or 14 sales projected for decades 1 and 2. It is reasonable that with less timber harvest activity within the South-Central Road System through time, the operators may be expected to travel further between operations than in the past. This additional travel can equate to longer commutes for operations and/or extended periods of time away from home.

TLMP (Alt. P) harvest schedule averages approximately 10,000 acres per decade (total 62,661 acres) for the South-Central Road System. Only during the 1960's have harvest levels approached the 10,000 acres per decade. Harvest is projected to be approximately 7,500 acres during the 1985-1994 decade. The total scheduled harvest with falldown is 39,476 acres for the period 1995-2054 with an estimated 21 percent at risk of economic, or soft falldown. This indicates that even with falldown, the traditional average harvest of 6,500 acres per decade could be accommodated through 2054. However, the decadal flow would fluctuate from 4,083 to 13,348 acres per decade.

The third aspect of a long-term timber harvest that needs to be addressed is the alteration of the natural environment when roads are constructed and timber is harvested (i.e., the impact of locational differences of timber cutting within Prince of Wales Island). Much of the economic and social value of Southeast Alaska is dependent on its natural setting. The recreation and tourism industry is based primarily on the natural setting and visual resources of the region. As National Forest System and other lands are converted from a natural condition to a managed forest, the activities dependent on and the values attributed to the natural state of the forested land, including subsistence, will be adversely affected. Moreover, the intrinsic value of the natural habitat in itself is diminished.

Table 4-36 in the *Vegetation and Timber* section of this chapter indicates an estimated 28 percent of Polk Inlet commercial forest lands would still have old-growth forests after decade 6 of forest plan implementation (year 2054). More restrictive land uses would add to this 28 percent old-growth acreage. For example, if expected falldown and potential changes to timber supply were to occur, one could expect the 28 percent figure to increase to 54 percent of commercial forest lands in the Polk Inlet Project Area. Similar expectations could be realistic for other Prince of Wales Island geographic areas included in the analysis.

Under falldown scenarios as discussed above, resources that are more dependent on old-growth forest conditions would benefit. Similarly, amenity values related to more natural conditions could benefit. Harvesting that leaves more residual trees (in contrast to clearcutting) will also contribute to a more natural-appearing landscape to the casual forest visitor.

The balance necessary to maintain a viable, robust economic and social environment is established at a National or Regional level, rather than at a project level. Cumulative economic and social effects of the proposed alternative actions in the Polk Inlet Project Area must ultimately be assessed in context with coinciding local, regional, and national economic and social developments. Based on regional standards and guidelines, the action alternatives have been constructed to minimize the negative cumulative effects on the economics and community values of the core communities when considering the total resource.

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Subsistence

Key Terms

Alaska National Interest Lands Conservation Act (ANILCA)—requires evaluations of subsistence impacts before changing the use of certain Federal lands.
Birds—includes ducks (e.g., mallards, widgeons, teals, shovelers, old squaws, golden eyes, and buffaloheads), seabirds and seaducks (e.g., scoters, murres, murrelets, puffins, seagulls, and cormorants), Canada geese, seabird eggs, and other birds.
Fin fish or fish—includes cod, halibut, flounder, sole, flatfish, rock fish, herring, eulachon, hooligan, Dolly Varden, steelhead, trout, and other fish (excluding salmon).
Invertebrates or shellfish—includes king crab, dungeness crab, tanner crab, shrimp, sea cucumber, sea urchins, abalone, octopus, scallops, gumboot, clams and cockles, other invertebrates, and herring eggs.
Land mammals—includes deer, moose, goat, black bear, wolf, small game, and furbearers (i.e., marten and land otter).
Marine mammals—harbor seal and other marine mammals.
Nonrural—a community with more than 7,000 people; does not qualify for priority use of subsistence resources. Ketchikan and Juneau in Southeast Alaska have been determined to be nonrural by the Federal Subsistence Board.
Plants—includes beach greens, mushrooms, roots, seaweed/kelp, and berries.
Rural—all Southeast Alaska communities other than Juneau and Ketchikan; residents qualify for priority use of subsistence resources.
Salmon—includes chinook (king), sockeye (reds), coho (silver), pink (humpback), and chum (dog).
Subsistence—customary and traditional uses by rural Alaskans of wild renewable resources.
Wildlife Analysis Area (WAA)—a division of land designated by Alaska Department of Fish and Game and used by the Forest Service for wildlife analysis.

Introduction

Section 810 of ANILCA (Public Law 96-487) requires a Federal agency having jurisdiction over lands in Alaska to evaluate the potential effects of proposed land use activities on subsistence uses and needs. Section 810 (a) of ANILCA states:

> In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands under any provision of law authorizing such actions, the head of the Federal agency having primary jurisdiction over such lands or his designee shall evaluate the effects of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, and other alternatives which would reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such Federal agency
>
> (1) gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to [ANILCA] Section 805;

(2) gives notice of, and holds, a hearing in the vicinity of the area involved; and
(3) determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands; (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such action.

This section evaluates how the proposed action alternatives could affect subsistence resources used by the rural communities in the Polk Inlet Project Area, including Craig, Hollis, Hydaburg, Kasaan, Klawock, and the nonrural community of Ketchikan. The subsistence resource categories evaluated are deer, black bear, furbearers, waterfowl, marine mammals, salmon, other finfish, shellfish, other food resources, and firewood.

Evaluation Criteria

Criteria used to evaluate the effects of the proposed alternatives are: (1) changes in abundance or distribution of subsistence resources, (2) changes in access to subsistence resources, and (3) changes in competition from nonsubsistence users for those resources. The evaluation determines whether subsistence opportunities in the Project Area or portions of the Project Area may be significantly restricted by any of the proposed action alternatives. To determine this, the evaluation: (1) considers the availability of subsistence resources in the surrounding areas, (2) considers the cumulative impacts of past, present, and foreseeable future activities on subsistence users and resources, (3) looks at potential cultural and socioeconomic implications affecting subsistence users, and (4) focuses on the mapped subsistence use area in the Project Area. The evaluation relies heavily upon the use of wildlife habitat capability models as well as upon ADF&G hunter survey data.

This subsistence evaluation considers, with distinct findings by alternative and by resource category, whether or not there is a significant possibility of a significant restriction of subsistence use. The Alaska Land Use Council's definition of "significant restriction of subsistence use" is one guideline used in the findings. By this definition:

> A proposed action shall be considered to significantly restrict subsistence uses, if after any modification warranted by consideration of alternatives, conditions, or stipulations, it can be expected to result in a substantial reduction in the opportunity to continue subsistence uses of renewable resources. Reductions in the opportunity to continue subsistence uses generally are caused by: reductions in abundance of, or major redistribution of resources; substantial interference with access; or major increases in the use of those resources by nonrural residents. The responsible line officer must be sensitive to localized, individual restrictions created by any action and make his/her decision after a reasonable analysis of the information available.

The U.S. District Court Decision of Record in Kunaknana v. Watt provided additional definitions of "significant restriction of subsistence uses" and are also used as guidelines in the findings. The definitions from Kunaknana v. Watt include:

Significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken shall have no or slight effect as opposed to large or substantial effects. In further explanation the Director (BLM) states that no significant restriction results when there would be "no or slight" reduction in the abundance of harvestable resources and no occasional redistribution of these resources. There would be no effect (slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting site; and there would be no substantial increase in competition for harvestable resources (that is, no substantial increase in hunting by nonrural residents).

Conversely, restrictions for subsistence uses would be significant if there were large reductions in abundance or major redistribution of these resources, substantial interference with harvestable access to active subsistence-use sites or major increases in nonrural resident hunting. In light of this definition, the finding of significant restriction must be made on a reasonable basis, because it must be decided in light of the total subsistence lands and resources that are available to individuals in surrounding areas living a subsistence lifestyle. The Draft EIS evaluates the availability of subsistence resources in surrounding areas that could be accessed without undue risk or economic hardship to subsistence users.

Most of the data in this section are analyzed by WAA, management units delineated by the ADF&G and used by the Forest Service. None of the WAA's are completely located within the Project Area. WAA's 1213, 1214, and 1317 are substantially located within the Project Area and only small portions of WAA's 1107 and 1332 are located within the Project Area. For a list of all the VCU's within WAA's, see Table 3-27.

Habitat capabilities and harvest numbers reported here are based on the entire WAA (including State and private lands), whereas in the *Wildlife* section, they are based only on the portion of the WAA within the Project Area. The Subsistence section analyzes habitat capability on an entire WAA basis to facilitate comparisons to animal harvest, which are available from ADF&G records on a WAA basis. It is important to note that there are substantial differences between the two sets of habitat capability numbers.

In order to account for increases in demand over time, observed harvest levels are increased for harvest projections based on Alaska State population projections. An average increase of 1.8 percent per year is used through 2010 and 1.5 percent per year thereafter.

Direct, Indirect, and Cumulative Impacts on Subsistence Use of Deer

Specific areas within the Polk Inlet Project Area are more important than others for harvest ing subsistence resources. Figures 3-24 through 3-28 depict Polk Inlet subsistence use areas were developed from the TRUCS database (Kruse and Muth 1990). Only rural communities and were surveyed by TRUCS; therefore, use of the Project Area by Ketchikan residents is not depicted. The deer harvest maps depict areas where more than 10 percent of households in one or more communities have ever harvested deer.

The greatest deer harvest use is concentrated along the Hollis-Klawock Highway, Hydaburg Road, and areas where Forest Service logging roads provide access to the Project Area, the beaches, and the areas in proximity to Hollis. Within the Project Area, the extent and location of the subsistence use area precludes complete avoidance. Areas other than subsistence use areas that could be harvested may be limited by other resource concerns such as soil and water protection, high value wildlife habitat, economics, visuals, or unit and road design. Effort was made to protect the highest value subsistence areas. For example, beach fringe is one of the highest use subsistence areas, and none would be harvested under any of the proposed alternatives.

Abundance and Distribution

Determining what harvest levels are sustainable assumes that habitat capability projections from the deer harvest model reflect an approximation of deer population. It also assumes that the distribution of deer harvest across a WAA is approximately proportional to the available habitat. Furthermore, it is based on the determination that the sustainable harvest is 10 percent of the deer population (Flynn and Suring 1989). The analysis assumes that the 1987 to 1991 mean deer harvest reflects rural and nonrural community use of deer in Project Area WAA's. ADF&G has collected deer harvest data for individual WAA's since 1987. Averaging the

deer harvest makes allowance for factors that influence deer numbers and hunting activity from year to year, such as weather patterns, access, habitat capability, and hunting success.

Nonrural residents harvested an average of 106 deer or 41 percent of the deer taken from the Project Area WAA's, while rural residents harvested an average of 150 deer or 59 percent during 1987 to 1991 (Table 3-59). Based on the assumptions described above, Table 4-74 presents the estimated Project Area deer population needed to support these harvests and compares them to habitat capabilities calculated for existing conditions and under the action alternatives. This table indicates that the estimated 1995 habitat capability can sustain the projected 1995 harvest levels in each WAA on a continuing basis.

Table 4-74

Project Area Deer Populations Needed to Support Predicted 1995 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 1998, by Alternative

	Population Needed to Support[1/]				1998 Habitat Capability[2/]			
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability[2/]	Alt. F2	Alt. 3	Alt. 4	Alt. F5
1107	205	145	350	7,311	7,309	7,309	7,309	7,309
1213	0	155	155	1,039	1,027	1,020	1,021	1,028
1214	470	555	1,025	1,979	1,921	1,926	1,908	1,926
1317	545	240	785	1,177	1,152	1,131	1,146	1,155
1332	415	45	460	2,820	2,806	2,803	2,805	2,805
Total	1,635	1,140	2,775	14,326	14,215	14,189	14,189	14,223

SOURCE: Thornton 1992. Data derived from ADF&G Deer harvest Survey Summary Statistics 1987-1991 and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using observed 1987-91 harvest levels, which are increased 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area. Habitat capabilities are reduced using Project Area Patch Size Effectiveness Index value.

After the Polk Inlet Project timber harvests are completed in 1998, estimated habitat capabilities in each WAA would still be well above estimated harvest levels for each action alternative. The population needed to support the total harvest as a percent of habitat capability would range from 5 to 67 percent for each WAA. Thus, the habitat capability for all WAA's should be able to sustain the subsistence harvest by rural and nonrural communities.

Access

Access to traditional subsistence use areas may be affected where logging activities take place near the beach fringe because traditional subsistence access includes use by boat on the beaches of the Project Area. The effect on access would probably be minor under all alternatives because no beach fringe would be harvested in the Project Area. Under Alternatives 3 and 4, respectively, new LTF's would be developed at Sunny Cove and Cannery Creek in Cholmondeley Sound, in addition to those already in existence. Development and operation of

these two new LTF's would result in minor impacts to the local beach fringe and marine habitat. Also, greater access would be available to this portion of the Project Area via temporary roads from harvest units to the LTF's.

New and rebuilt roads would provide access to areas that were not previously used for subsistence harvest of deer. Miles of road proposed for construction and reconstruction are provided in Table 4-59. New access would be greatest for Alternatives 3 and 4 and least for Alternative F5. Road access would favor harvest by residents who live in communities connected to the road system or who bring a vehicle to Prince of Wales Island on the ferry. Road access details are presented in *Transportation and Facilities*.

Competition

Competition for subsistence resources in the Polk Inlet Project Area is an issue for residents of Prince of Wales Island. Residents are concerned about competition from residents of Ketchikan, mostly because of the numbers of people that come to Prince of Wales via the ferry. Because Ketchikan residents are considered nonrural, this competition can be regulated if it starts to restrict rural residents' ability to obtain subsistence resources.

Table 3-59 shows the distribution of deer harvest in Project Area WAA's among rural and nonrural communities. Data indicate there is competition with nonrural hunters. Fifty percent or more of the deer are harvested by nonrural hunters in WAA's 1107, 1213, and 1214. Significant nonrural harvest also occurs in WAA 1317. These levels reflect competition by Ketchikan residents with rural subsistence users. However, overall, deer habitat capability in all WAA's currently and within the foreseeable future is capable of sustaining rural and nonrural subsistence harvest (Tables 4-75 and 4-76).

Table 4-75

Project Area Deer Populations Needed to Support Predicted 2004 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 2004

	Population Needed to Support[1/]				
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability[2/]	2004 Habitat Capability[2/]
1107	240	160	400	7,311	7,309
1213	0	180	180	1,039	1,002
1214	540	650	1,190	1,979	1,879
1317	630	280	910	1,177	1,152
1332	480	50	530	2,820	2,806
Total	1,900	1,320	3,210	14,326	14,148

SOURCE: Thornton 1992. Data derived from ADF&G Deer Harvest Survey Summary Statistics 1987-1991 and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 2004 harvest levels using 1987-91 harvest levels, which are increased by 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and are reduced for patch size effectiveness. Habitat capabilities in 2004 assume Alternative F2 plus an additional 80 MMBF entry.

The Federal Subsistence Board may use its authority to regulate nonrural harvest of deer and has authority to prioritize the harvest of deer among rural residents when necessary to protect the resource. This type of action, as prescribed by ANILCA, Section 804, may be necessary to ensure the availability of adequate abundance of deer needed by the rural communities using the Project Area whether or not the proposed actions are implemented. The apparent current deer population level does not necessarily require restrictions on nonrural users.

Individual household use of specific areas may be displaced by some of the proposed actions. There is not sufficient information available to evaluate displacement potential for individual households, nor would it be practical. The Project Area's accessibility makes it very unlikely that an individual household or even an entire community is highly dependent on specific areas within the Project Area that may be affected by proposed alternatives. The known uses of the Project Area by individual communities are discussed in Chapter 3.

The evaluation indicates that there is adequate deer abundance within the area historically used by residents of each community to meet subsistence needs. Any displacement that may occur is likely to be to other areas within a household's or community's historical range. Furthermore, any displacement that may occur would likely be temporary until activities within the Project Area conclude in 3 to 5 years.

Cumulative Effects

Table 4-75 displays the effect of Polk Inlet Project timber harvesting together with the harvesting of an estimated 48 million board feet (1,778 acres) in another entry from 1998 through 2004, the assumed reasonably foreseeable future harvest volume (see *Vegetation and Timber Resources*). Predicted habitat capabilities would still be adequate to support current deer harvest levels needed in all WAA's. This conclusion holds true even though all private, State, and encumbered lands are considered. The deer population needed to support the total harvest in all Project Area WAA's (both inside and outside of the Project Area and including private, State, and encumbered lands) is estimated at 3,210 (Table 4-75). The deer habitat capability in 2004 for the Project Area WAA's would exceed this number by 11,116 deer (Table 4-75)

Cumulative effects of harvesting 37,221 acres from 2004 to 2054 were assessed under the assumption that all second growth had entered the closed canopy stage. The projected number of deer available for harvest in the year 2054 generally would be sufficient to meet both subsistence and nonsubsistence demands (7,636 deer habitat capability versus a population needed to support harvest of 5,700) (Table 4-76). However, significant reductions would occur in habitat capability and problems could occur in some WAA's. WAA populations needed to support harvest levels would be substantially below habitat capability for WAA's 1214 and 1317. Based on projections, it appears that habitat capability will drop below the level needed to support total demand around the year 2024 in WAA 1214 and between 2004 and 2024 in WAA 1317. By 2054, subsistence deer harvesting may be significantly affected by competition with nonrural hunters and a need to restrict nonrural harvesting of deer in some WAA's could result. The fact that the habitat capability in 2054 (7,636 deer) would be substantially greater than the population needed to support the total subsistence harvest (3,363 deer) indicates that the need to restrict rural harvesting of deer would be unlikely.

Community Analysis

The following sections are organized by community. They draw on four types of data presentations: (1) percent of a community's deer harvest that occurred within the Project

Area WAA's; (2) tables showing acreage of subsistence use areas harvested under Project alternatives; and (3) figures comparing the current and projected habitat capability of deer available for harvest in Project Area WAA's with populations needed to support harvest.

The first type of data is the percent of community deer harvest that occurs within the boundaries of the Project Area. This information was presented and discussed in Chapter 3.

Table 4-76

Project Area Deer Populations Needed to Support Predicted Total Demand Compared to Habitat Capability through 2054

WAA	Rural Harvest Percentage[1/]	2004 Needed Pop'n.[2/]	2004 Habitat Capability[3/]	2024 Needed Pop'n.[2/]	2024 Habitat Capability[3/]	2054 Needed Pop'n.[2/]	2054 Habitat Capability[3/]
1107	59	400	7,309	540	5,853	720	3,897
1213	0	180	1,002	240	832	310	554
1214	46	1,190	1,879	1,600	1,584	2,110	1,055
1317	69	910	1,152	1,220	942	1,620	627
1332	90	530	2,806	710	2,258	940	1,503
Total	59	3,210	14,148	4,310	11,469	5,700	7,636

SOURCE: Thornton 1992. Data derived from ADF&G Deer Harvest Survey Summary Statistics 1987-1991 and Forest Service, Ketchikan Area, database.

1/ Percentage of current total harvest.

2/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted harvest levels using 1987-91 average harvest levels, which are increased by 1.8% per year through 2010 and 1.5% per year thereafter.

3/ Habitat capabilities are for the entire WAA, including portions outside the Project Area, and are reduced for patch size effectiveness. Habitat capabilities for 2004 assume Alternative F2 plus an additional 80 MMBF entry. Habitat capabilities for 2024 and 2054 are estimated by reducing 1995 habitat capabilities in the same proportion as the Polk Inlet Project Area reductions between 1995 and 2024/2054.

The second type of data presentation displays the amount of acreage overlapping between proposed cutting units and areas used for subsistence deer hunting by more than 10 or 15 percent of the households in a given community. Tables 4-78 and 4-79 summarize the analysis for each community, based on detailed maps of each community located in the Planning Record. Results show that each of the action alternatives would harvest an average of about 1 percent of that portion of the Project Area used by 10 percent or more of rural community households; Alternative 1a would defer harvest on about 1 percent of the area relative to Alternative 1.

Table 4-77
Acreage Used by More than 10 Percent of Rural Community Households for Deer Hunting, and Acres Proposed for Timber Harvest, by Alternative and Community

Rural Community	Acres Used by ≥10% of Community Households	Acreage Proposed for Harvest by Alternative					
		1a	1	F2	3	4	F5
Craig	7,241	-84	0	5	43	32	5
Hollis	18,895	-231	0	180	258	102	20
Hydaburg	6,354	-175	0	18	56	49	18
Kasaan	9,438	-134	0	201	45	215	201
Klawock	1,468	0	0	1	1	1	1
Total	43,396	-624	0	405	403	399	245

SOURCE: Kruse and Muth 1990. Derived from TRUCS database using GIS.

Table 4-78
Acreage Used by More than 15 Percent of Rural Community Households for Deer Hunting, and Acres Proposed for Timber Harvest, by Alternative and Community

Rural Community	Acres Used by ≥15% of Community Households	Acreage Proposed for Harvest by Alternative					
		1a	1	F2	3	4	F5
Craig	94	0	0	0	0	0	0
Hollis	1,528	-14	0	0	0	0	0
Hydaburg	631	0	0	5	5	5	5
Kasaan	4,673	-52	0	128	0	128	128
Klawock	1,468	0	0	0	0	0	0
Total	8,394	-66	0	133	5	133	133

SOURCE: Kruse and Muth 1990. Derived from TRUCS database using GIS.

The third type of data presentation compares the estimated supply and demand for deer for the Project Area WAA's from which a particular community currently harvests deer. These figures compare: (1) the estimated effects on the area's ability to support deer populations if the TLMP Draft Revision is implemented; and (2) the estimated demand for deer for the same area, assuming demand remains about the same. Figures 4-27 through 4-30 help answer the question of whether the cumulative effects of past activities, proposed actions, and scheduled actions to the year 2054 would reduce the number of deer available to a number

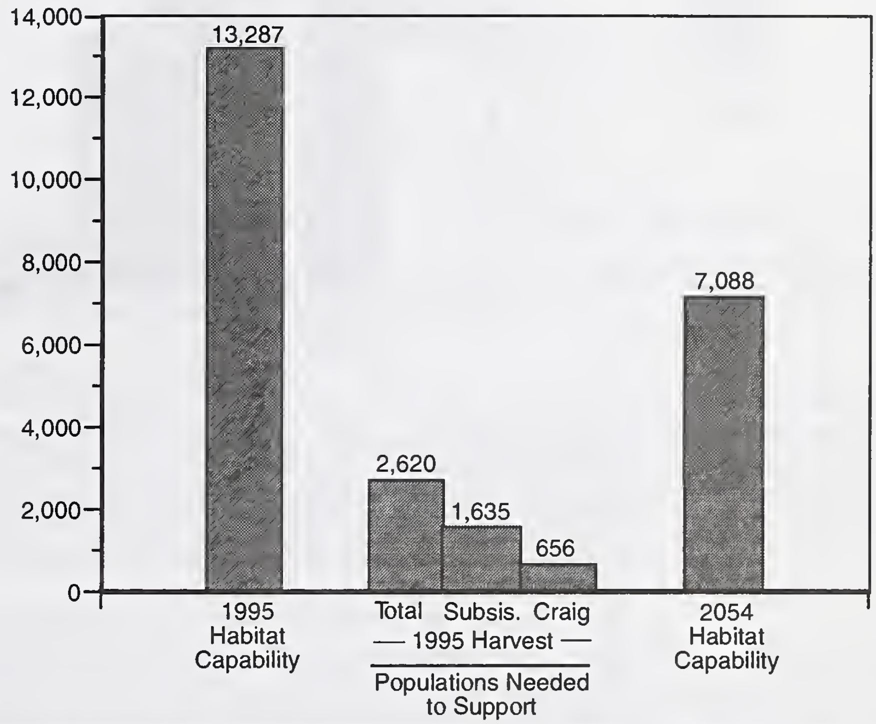
below subsistence demands in each community's primary use area. A figure is not provided for Kasaan because no deer were harvested in the Project Area from 1987-1991.

Craig

Ten percent of Craig's deer came from the Project Area WAA's and an estimated 5 percent came from the Project Area between 1987 and 1991 (Table 3-59). Figure 4-27 shows that there is an adequate number of deer in Project Area WAA's used by Craig residents to meet the current subsistence and sport hunting demand in 1995 but that deer habitat capability would decline to a level approaching the population needed to support the harvest by 2054 (with implementation of Alternative P of the TLMP Draft Revision). Table 4-77 shows that the action alternatives would harvest between 32 and 43 acres of land used for hunting by at least 10 percent of the Craig households. Based on the amount of the Project Area used by Craig residents for deer hunting and the cumulative reductions in habitat capability in these WAA's, there may be a significant possibility of a significant restriction of the subsistence use of deer by Craig residents if nonrural harvesting is not restricted, for all action alternatives.

Figure 4-27

Deer Habitat Capability and Populations Needed to Support Harvest in Project Area WAA's Used by Craig Residents[1/]



SOURCE: Derived from ADF&G Deer Harvest Survey Summary Statistics, 1987-1991, and Project Area Habitat Capability Model Analysis
1/ Includes only those Project Area WAA's where deer were harvested by Craig residents (WAA's 1107, 1214, 1317, and 1332). Populations needed were calculated using 10 times the harvest based on Flynn and Suring (1989). 1995 harvest levels were estimated assuming a 1.8% increase per year.

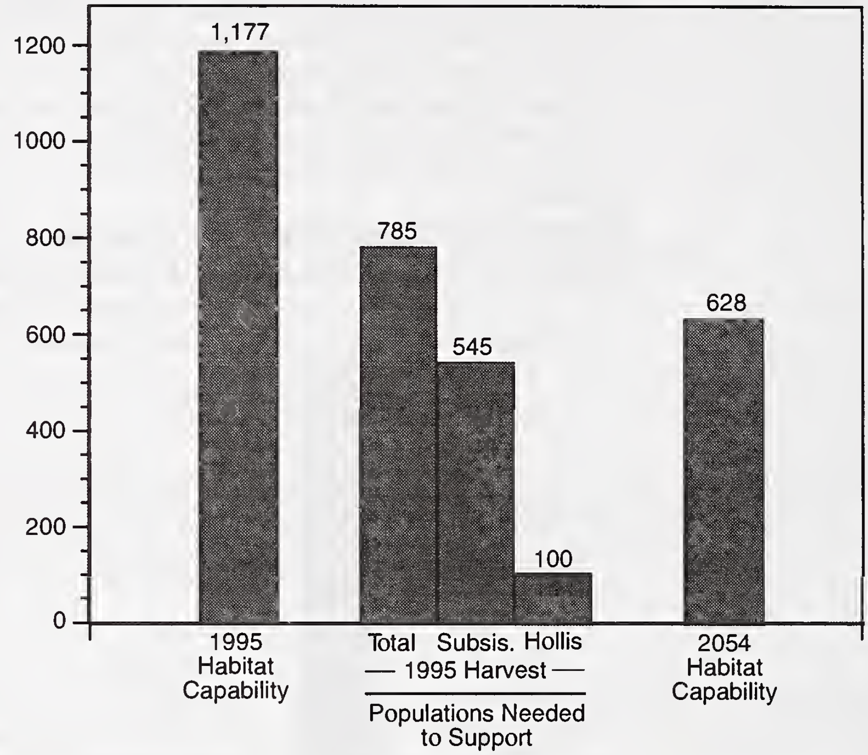
Hollis

Thirty percent of Hollis' deer came from the Project Area WAA's and an estimated 27 percent came from the Project Area between 1987 and 1991 (Table 3-59). Figure 4-28 shows there is an adequate number of deer in Project Area WAA's used by Hollis residents to meet the subsistence demand in 1995, but that harvest would exceed the population needed to support harvest by 2054 (with implementation of Alternative P of the TLMP Draft Revision).

Table 4-77 shows that the action alternatives would harvest 102 to 258 acres used for hunting by at least 10 percent of the Hollis households. Based on the amount of the Project Area used by Hollis residents for deer hunting and the cumulative reduction in habitat capability of WAA 1317, there is a significant possibility of a significant restriction of the subsistence use of deer by Hollis residents if nonrural harvesting is not restricted for all action alternatives sometime before 2054.

Figure 4-28

Deer Supply Habitat Capability and Populations Needed to Support Harvest in Project Area WAA's Used by Hollis Residents[1/]



SOURCE: Derived from ADF&G Deer Harvest Survey Summary Statistics, 1987-1991, and Project Area Habitat Capability Model Analysis

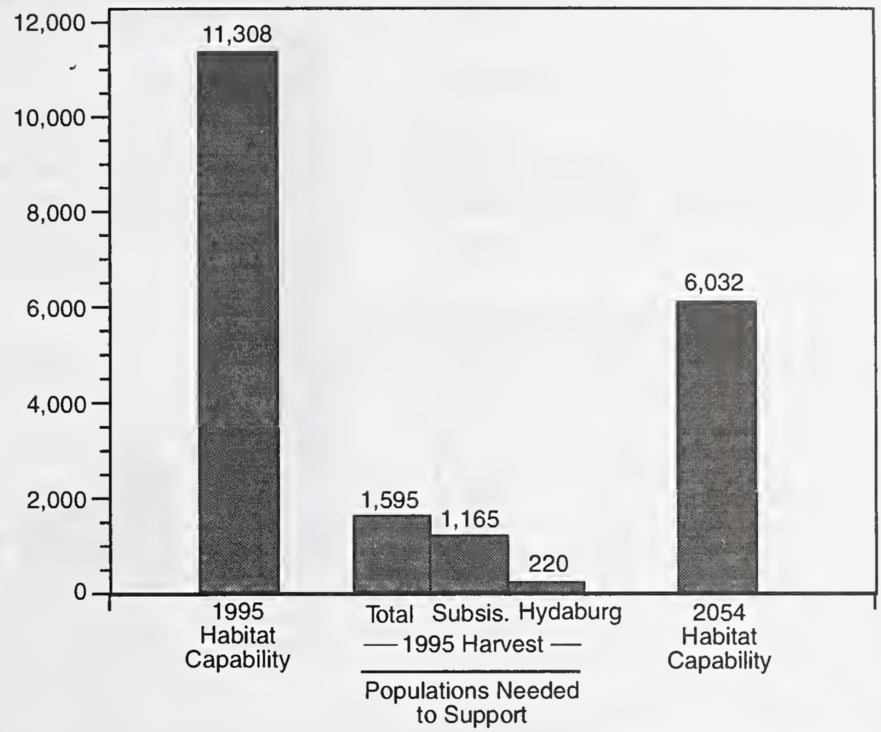
1/ Includes only those Project Area WAA's where deer were harvested by Hollis residents (WAA 1317). Populations needed were calculated using 10 times the harvest based on Flynn and Suring (1989). 1995 harvest levels were estimated assuming a 1.8% increase per year.

Hydaburg

Thirty-nine percent of Hydaburg's deer came from Project Area WAA's and an estimated 6 percent came from the Project Area between 1987 and 1991 (Table 3-59). Figure 4-29 shows that there is an adequate number of deer in Project Area WAA's used by Hydaburg residents to meet the subsistence and sporthunting demand in 1995 but that deer habitat capability would decline to a level approaching the population needed to support the harvest by 2054 (with implementation of Alternative P of the TLMP Draft Revision). Table 4-77 shows that the action alternatives would harvest between 49 and 56 acres of land used by at least 10 percent of the Hydaburg households. Based on the amount of the Project Area used by Hydaburg residents for deer hunting and the cumulative reductions in habitat capability in these WAA's, there may be a significant possibility of a significant restriction of the subsistence use of deer by Hydaburg residents if nonrural harvesting is not restricted, for all action alternatives, sometime before 2054.

Figure 4-29

Deer Supply Habitat Capability and Populations Needed to Support Harvest in Project Area WAA's Used by Hydaburg Residents[1/]



SOURCE: Derived from ADF&G Deer Harvest Survey Summary Statistics, 1987-1991, and Project Area Habitat Capability Model Analysis

1/ Includes only those Project Area WAA's where deer were harvested by Hydaburg residents (WAA's 1107, 1317, and 1332). Populations needed were calculated using 10 times the harvest based on Flynn and Suring (1989). 1995 harvest levels were estimated assuming a 1.8% increase per year.

Kasaan

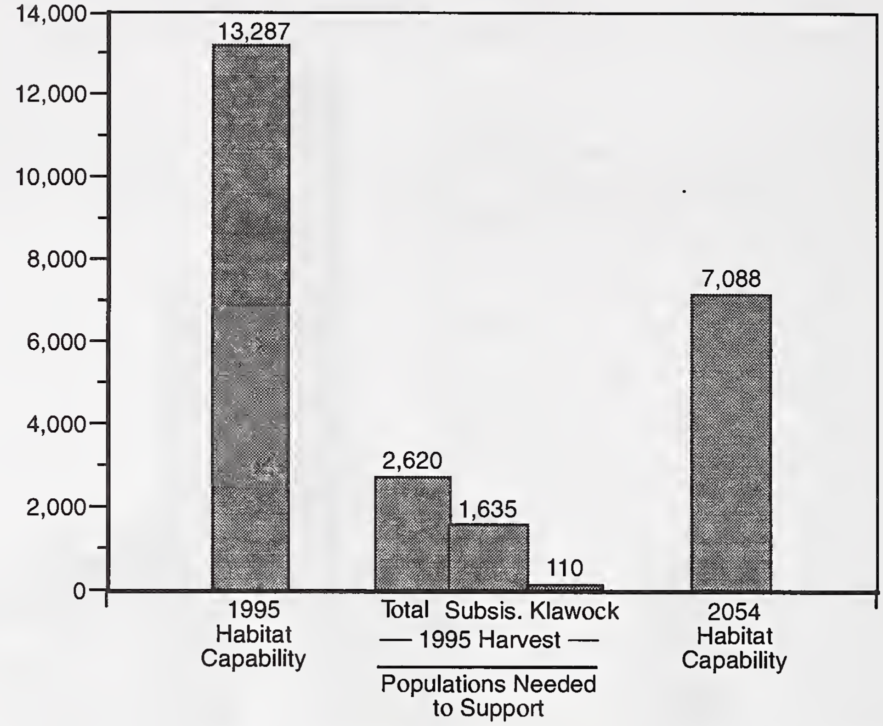
None of Kasaan's deer harvest came from the Project Area WAA's between 1987 and 1991 (Table 3-59). Table 4-77 shows that the action alternatives would harvest between 45 and 215 acres of land historically used for deer hunting by at least 10 percent of the Kasaan households in WAA's 1214 and 1317. Based on the historical use of the Project Area by Kasaan residents for deer hunting, there may be a significant possibility of a significant restriction of the subsistence use of deer by Kasaan residents over the long term.

Klawock

Three percent of Klawock's deer came from the Project Area WAA's and an estimated 2 percent came from the Project Area between 1987 and 1991 (Table 3-59). Figure 4-30 shows there is an adequate number of deer in Project Area WAA's used by Klawock residents to meet the subsistence demand in 1995 but that deer habitat capability would decline to a level approaching the population needed to support them through 2054 (with implementation of Alternative P of the TLMP Draft Revision). Table 4-77 shows that the action alternatives would harvest about 1 acre of land used by at least 10 percent of the Klawock households. Based on the limited amount of the Project Area used by Klawock residents for deer hunting, there is not a significant possibility of a significant restriction of the subsistence use of deer by Klawock residents associated with any of the alternatives.

Figure 4-30

Deer Supply Habitat Capability and Populations Needed to Support Harvest in Project Area WAA's Used by Klawock Residents 1/



SOURCE: Derived from ADF&G Deer Harvest Survey Summary Statistics, 1987-1991, and Project Area Habitat Capability Model Analysis
1/ Includes only those Project Area WAA's where deer were harvested by Klawock residents (WAA's 1107, 1317, and 1332). Populations needed were calculated using 10 times the harvest based on Flynn and Suring (1989). 1995 harvest levels were estimated assuming a 1.8% increase per year.

Project Area Camps

Several logging camps and small groups of cabins occur in the Project Area and its vicinity. These include Polk Inlet, Smith Cove (Skowl Arm), Natzuhini, Cholmondeley Camps, Sunny Creek, and Cannery Creek. Because a substantial portion of the subsistence activities of residents of these communities are conducted with the Project Area, the Project is likely to affect them to some degree. According to ADF&G deer harvest data, the only WAA with significant harvest by Project Area Camps is WAA 1214. An average of 32 deer were harvested annually in this WAA by residents of Polk Inlet/Skowl Arm Camps, Cholmondeley Camps, and Natzuhini Camp during 1987-1991. No other WAA recorded a harvest of more than 1 deer on average, although it is likely that WAA 1213 supports subsistence harvest by the Cholmondeley Camps, Sunny Cove, and Cannery Creek. Based on the level of existing harvest in WAA 1214, there is a significant possibility of a significant restriction of the subsistence use of deer by Project Area Camp residents (particularly Polk Inlet/Skowl Arm and Cholmondeley Camps), if nonrural harvesting is not restricted sometime before 2054.

Summary of Findings for Deer

None of the proposed actions would create a significant possibility of a significant restriction of subsistence use of Sitka black-tailed deer by the residents of any of the communities through the reasonably foreseeable future. However, if scheduled harvest takes place, there would be a significant possibility that Hollis residents would be significantly restricted and

there may be a significant possibility of a significant restriction for Craig, Hydaburg, and Kasaan residents prior to 2054 if nonrural harvesting is not restricted (Table 4-79). Significant reduction in habitat capability might restrict subsistence deer harvesting in WAA's 1214 and 1317 prior to 2054 if nonrural harvesting is not restricted. Under-reporting of deer harvest in rural communities might increase the likelihood of nonrural harvest restrictions in the future.

Table 4-79
Significant Possibility of a Significant Restriction of Subsistence Use of Sitka Black-tailed Deer by 2054 for each Alternative and Community

	Significant Possibility of Restriction					
Community	**Alt. 1**	**Alt. 1a**	**Alt. F2**	**Alt. 3**	**Alt. F4**	**Alt. F5**
Abundance or Distribution:						
Craig	May	May	May	May	May	May
Hollis	Yes	Yes	Yes	Yes	Yes	Yes
Hydaburg	May	May	May	May	May	May
Kasaan	No	No	May	May	May	May
Klawock	No	No	No	No	No	No
Project Area Camps	Yes	Yes	Yes	Yes	Yes	Yes
Access:						
All communities	No	No	No	No	No	No
Competition:						
All communities	No	No	No	No	No	No

Note: "No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect in the future. "May" indicates there may be a significant possibility of a substantial effect in the future.

Direct, Indirect, and Cumulative Impacts on Subsistence Use of Other Resources

Abundance and Distribution

Black Bear

Black bear generally are not utilized as a major food source but are mostly hunted for sport. However, limited use is made of parts of the bear for cultural purposes. Almost 90 percent of the black bear taken from the Project Area since 1988 have been harvested by nonresident hunters.

In 1995, black bear habitat capability is 680 versus the 600 needed to support harvests (Table 4-80). Capability is less than the population needed in WAA's 1214 and 1317, and is greater than needed in WAA's 1107, 1213, and 1332. Black bear habitat capability is assumed to reflect potential black bear abundance. Non-Project Area communities harvest the majority of black bears in each of the WAA's, thus providing significant competition to residents of Project Area communities. No significant overall reduction in black bear habitat capability would occur as a result of the Polk Inlet timber harvesting alternatives.

Table 4-80
Project Area Black Bear Populations Needed to Support Predicted 1995 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 1998, by Alternative

	Population Needed to Support[1/]				1998 Habitat Capability[2/]			
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability[2/]	Alt. F2	Alt. 3	Alt. 4	Alt. F5
1107	45	110	155	286	286	286	286	286
1213	0	45	45	59	59	58	58	59
1214	20	185	205	130	130	130	130	130
1317	20	100	120	83	83	82	82	83
1332	10	65	75	122	121	121	121	121
Total	95	505	600	680	679	677	677	679

SOURCE: Paul 1992. Data derived from ADF&G Black Bear Harvest Survey Summary Statistics 1988-1992 and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using observed 1988-1992 harvest levels, which are increased 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area. Habitat capabilities are reduced using estimated disturbance factors to account for disturbance associated with roads.

Roads left open to vehicle access for bear hunting following timber harvest may increase hunting success. No timber harvest is proposed within beach and estuary fringe habitats. Changes in local black bear distribution would occur in the vicinity of ongoing timber harvest activities during the life of the proposed project. Bears tend to move back into these areas after timber harvest is completed. Further changes in local black bear distribution are expected when the age of the second growth on harvest units reaches about 25 years.

Furbearers

Furbearers are currently being trapped in the Project Area. Tables 4-81 and 4-82 show marten and river otter harvests by Project Area and non-Project Area communities and impacts.

In 1995, marten habitat capability was 610 compared to a needed population of 509, or 20 percent more than needed (see Table 4-81). This suggests that there may already be significant competition for marten within the Project Area, with much of that competition coming from nonrural communities outside of the Project Area. WAA's 1213, 1214, and 1317 do not currently provide the habitat capability needed to support projected 1995 harvest levels. The proposed timber harvest for Polk Inlet would further reduce marten habitat capability by an additional 6 to 9 marten, or 1 percent. Roads left open for public use during trapping season may further decrease marten populations.

Table 4-81

Project Area Marten Populations Needed to Support Predicted 1995 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 1998, by Alternative

	Population Needed to Support[1/]				1998 Habitat Capability[2/]			
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability[2/]	Alt. F2	Alt. 3	Alt. 4	Alt. F5
1107	66	35	101	268 (80)	268	268	268	268
1213	0	118	118	53 (53)	52	52	52	52
1214	121	74	195	111 (11)	107	108	107	108
1317	74	6	80	73 (7)	71	69	71	71
1332	9	6	15	105 (69)	104	104	104	104
Total	270	239	509	610 (220)	603	601	602	604

SOURCE: Paul 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1992, and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using 1987-91 harvest levels, which are increased 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area. Habitat capabilities are reduced using Project Area Patch Size Effectiveness Index value. Numbers in parentheses represent habitat capability after being reduced by the Road Density Index and underestimate habitat capability in some WAA's.

In 1995, overall river otter habitat capability is about 6 times greater than that required to support harvests (473 compared to 76) (Table 4-82). Competition between rural and nonrural communities does not appear to be significant. Proposed Polk Inlet timber harvest alternatives would not alter river otter habitat capability, thus habitat capabilities would continue to meet harvest demand.

Table 4-82

Project Area River Otter Populations Needed to Support Predicted 1995 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 1998, by Alternative

	Population Needed to Support[1/]				1998 Habitat Capability[2/]			
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability	Alt. F2	Alt. 3	Alt. 4	Alt. F5
1107	1	27	28	120	120	120	120	120
1213	0	10	10	97	97	97	97	97
1214	3	2	5	109	109	109	109	109
1317	28	0	28	49	49	49	49	49
1332	1	4	5	97	97	97	97	97
Total	33	43	76	473	473	473	473	473

SOURCE: Paul 1992. Data derived from ADF&G River Otter Harvest Survey Summary Statistics 1988-1992.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 1995 harvest levels using observed 1988-92 harvest levels, which are increased 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area.

Waterfowl

A variety of waterfowl use the freshwater and saltwater habitats in the Project Area. The Vancouver Canada goose was selected as an indicator of potential project effects on waterfowl. Vancouver Canada goose habitat capability is assumed to reflect potential Vancouver Canada goose abundance and waterfowl abundance. It is projected that habitat capability for Vancouver Canada goose has decreased 14 percent since 1954 (from 440 to 377). Implementation of Alternatives F2 through F5 would decrease habitat capability by 9 to 11 geese. The primary impact to the Vancouver Canada goose under each of the action alternatives would include reductions in the availability of old-growth forest associated with large bodies of water.

Timber harvest unit locations generally avoid important waterfowl areas. The estuary grass flats, beach fringe, and borders of inland lakes and streams would remain largely unaffected. There are no acres of beach fringe or estuary fringe proposed for harvest.

Marine Mammals

Federal law prohibits the taking of marine mammals by anyone other than Native hunters. There is no evidence that timber harvest activities have had any effect on marine mammals taken for subsistence, or that harvest activities have any effect on marine mammal habitat.

Salmon

Salmon are a major subsistence food harvested in the Polk Inlet Project Area. The *Watersheds and Fisheries* section concludes that potential effects of the proposed timber harvest and road construction alternatives on salmon spawning and rearing habitat would be minimal or eliminated by applying the Forest Service standards, guidelines, and prescriptions described in detail in the Aquatic Habitat Management Handbook (Forest Service 1986a) and Soil and

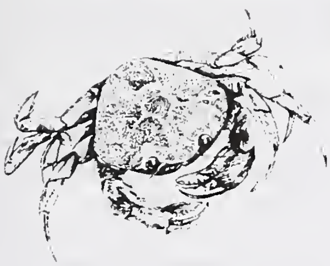
Water Conservation Handbook (Forest Service 1991c). All salmon spawning and rearing streams (Class I and Class II streams) near proposed timber harvest units are protected by buffers of at least 100 feet as prescribed in the TTRA. In addition, specific prescriptions for protecting salmon habitat were incorporated during the design of harvest and roads.

Based on the implementation of site-specific prescriptions for protecting salmon spawning and rearing habitat, the immediate and foreseeable effects on the abundance and distribution of salmon for subsistence uses in the Project Area would not be measurable.

Other Finfish

The action alternatives for the proposed project would have no immediate or foreseeable effect on other finfish habitat. Because there would be no effect on other finfish habitat, the abundance and distribution of those other finfish would not be affected.

Shellfish



Based on the limited impact the existing LTF sites have on marine and estuarine habitat, crabs, and benthic organisms, the effect of this project on the abundance and distribution of local crabs, clams, and other shellfish would not be measurable for purposes of subsistence. One new LTF site would be developed under Alternatives 3 and 4, but these would be small enough in size to have insignificant effects on subsistence use of shellfish resources. The project would not have any additional impacts on shellfish for the foreseeable future.

Other Food Resources

Other foods include plants such as kelp, goose tongue, a variety of berries, and so forth. Most traditional gathering of these foods occurs near beach and estuarine areas. Timber harvest units and roads proposed in action Alternatives F2 through F5 in the Project Area may infringe upon beach areas potentially used for other food gathering if gathering extends beyond 500 feet of the beach (there are no proposed harvest units within 500 feet of the beach). Road construction activities would improve access to berry picking sites that are now not reasonably accessible.

Because beach fringe and estuaries would not be significantly affected by the proposed timber harvest, and because additional food gathering sites would be made available, the Project's activities and foreseeable impacts are not expected to substantially affect the abundance and distribution of other foods.

Firewood/Personal Use Wood

The Forest Service has a free-use policy (with limits) for firewood and timber and none of the proposed alternatives would have an adverse effect on the availability of firewood, personal-use timber, and traditional uses of wood, such as for totem poles.

Access

Access to traditional subsistence use areas may be affected where logging activities are located along existing roads or in the beach fringe. This is because traditional subsistence access is by motorized vehicle or by boat to the beaches of the Project Area (Ellanna and Sherrod 1987). The effect on access would probably be minor under all alternatives because no beach fringe would be harvested in the Project Area and no marine and estuarine habitat would be affected by logging activities.

New and rebuilt roads would provide motorized vehicle access to areas that were not previously used for subsistence harvesting resources (see alternative maps, separate map packet, for details). Miles of road proposed for construction are shown in Table 4-59. Road access would favor harvest by residents who live in communities connected to the road system or who bring a vehicle to Prince of Wales Island on the ferry. Road closures and other management prescriptions developed for Project Area roads would take subsistence uses into consideration.

Competition

Competition for subsistence resources in the Polk Inlet Project Area is an issue to residents of Prince of Wales Island. Residents are concerned with competition from residents of Ketchikan, mostly because of the numbers of people that come to the island via the ferry. Subsistence resources most likely to be affected by competition from Ketchikan residents include deer, bear, and marten. Because Ketchikan residents are considered nonrural, this competition could be regulated if it starts to restrict nonrural residents' ability to obtain subsistence resources.

There is no evidence to indicate that availability of salmon, finfish, shellfish, or other food resources to subsistence users would be affected by sport or nonrural harvest. Any increase in competition from nonrural residents and Alaska nonresidents would not be substantial because of the availability of resources in the immediate vicinity and in the surrounding areas.

Individual household use of specific areas may be displaced by some of the proposed actions. There is not sufficient information available nor would it be practical to evaluate displacement potential for individual households. The Project Area's accessibility makes it very unlikely that an individual household or even an entire community is highly dependent on specific areas within the Project Area that may be affected by proposed actions. Generally, there are sufficient lands available elsewhere within or outside the Project Area and within the home range of the communities for subsistence gathering. The known uses of the Project Area by individual communities are discussed earlier in this section.

Cumulative Effects

Harvesting levels for the reasonably foreseeable future (to 2004) (an additional 48 MMBF from 1,778 acres after the Polk Inlet harvests) generally would not significantly alter the habitat capability from 1995 for black bear, marten, and river otter when compared to the impacts of the Polk Inlet Project (1997). Habitat capability generally would be equal to populations needed to support black bear harvest levels, except in WAA's 1214 and 1317 (Table 4-83). Similarly, habitat capability would be close to the population needed to support harvests for marten (Table 4-84), but would be higher for river otter (Table 4-85). The population needed to support harvests of marten would be greater than habitat capability for WAA's 1213, 1214, and 1317. In summary, by the year 2004 there may be a significant possibility of a significant restriction in the availability of marten for subsistence use in WAA's 1213, 1214, and 1317. Restricting nonrural harvests of these resources in the WAA's showing reduced habitat capability may be required to avoid subsistence restrictions.

Based on projected future timber harvest, a total of approximately 37,221 acres would be harvested in the Project Area from 2004 through 2054. The *Wildlife* section projects that this level of harvest would affect the habitat capability of most wildlife species. The changes in habitat capability could affect their abundance and distribution. Relative to habitat capability estimated for 1954, the potential marten habitat capability by the year 2054 is projected to decrease cumulatively by 60 percent; the potential river otter habitat capability is projected to decrease cumulatively by 20 percent; the potential black bear habitat capability is projected to decrease cumulatively by 50 percent; and the potential Vancouver Canada goose habitat capability is projected to decrease cumulatively by 74 percent.

Table 4-86 provides estimates of changes in black bear habitat capability from 2004 through 2054, and Table 4-87 displays similar information for marten. River otter habitat capabilities would decline by only 1 river otter from that available in 1994, 1997, and 2004 (from 42 to 41). By 2054, black bear habitat capability would be about 61 percent of that needed to support harvests in WAA 1107, 43 percent in WAA 1213, 20 percent in WAA 1214, 22 percent in WAA 1317, and 51 percent of the level needed in WAA 1332.

Table 4-83

Project Area Black Bear Populations Needed to Support Predicted 2004 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 2004

	Population Needed to Support 1/				
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability 2/	2004 Habitat Capability 2/
1107	50	130	180	286	276
1213	0	50	50	59	53
1214	20	220	240	130	127
1317	20	120	140	83	82
1332	10	80	90	122	119
Total	100	600	700	680	657

SOURCE: Paul 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1992 and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 2004 harvest levels using 1988-92 harvest levels, which are increased by 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area; they are reduced using estimated disturbance factors to account for disturbance associated with roads. Habitat capabilities in 2004 assume Alternative F2 plus an additional 80 MMBF entry.

Table 4-84

Project Area Marten Populations Needed to Support Predicted 1995 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 2004

	Population Needed to Support[1/]				
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability[2/]	2004 Habitat Capability[2/]
1107	77	41	118	268 (80)	268 (79)
1213	0	135	135	53 (53)	50 (50)
1214	130	80	210	111 (11)	105 (9)
1317	82	6	88	73 (7)	71 (7)
1332	9	6	15	105 (69)	104 (69)
Total	298	268	566	610 (220)	598 (214)

SOURCE: Paul 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1992 and Forest Service, Ketchikan Area, database.

1/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted 2004 harvest levels using 1988-92 harvest levels, which are increased by 1.8% per year.

2/ Habitat capabilities are for the entire WAA, including portions outside the Project Area; they are reduced using Project Area Patch Size Effectiveness. Habitat capabilities for 2004 assume Alternative F2 plus an additional 80 MMBF entry. Numbers in parentheses represent habitat capability after being reduced by the Road Density Index and underestimate habitat capability in some WAA's.

Table 4-85

Project Area River Otter Populations Needed to Support Predicted 2004 Demand from Rural and Nonrural Communities Compared to Habitat Capability in 2004

	Population Needed to Support[1/]				
WAA	Rural Harvest	Nonrural Harvest	Total Harvest	1995 Habitat Capability[2/]	2004 Habitat Capability[2/]
1107	1	29	30	120	120
1213	0	15	15	97	97
1214	3	2	5	109	109
1317	30	0	30	49	49
1332	1	4	5	97	97
Total	35	50	85	473	473

SOURCE: Paul 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1992.

1/ Estimates are based on the percent of WAA habitat capability in the Project Area.

2/ Habitat capabilities are for nonencumbered National Forest System lands in the Project Area.

Table 4-86
Project Area Black Bear Populations Needed to Support Predicted Total Demand Compared to Habitat Capability Through 2054

WAA	Rural Harvest Percentage[1/]	2004 Needed Pop'n.[2/]	2004 Habitat Capability[3/]	2024 Needed Pop'n.[2/]	2024 Habitat Capability[3/]	2054 Needed Pop'n.[2/]	2054 Habitat Capability[3/]
1107	29	180	286	240	249	310	190
1213	0	50	59	60	51	90	39
1214	11	240	130	320	113	430	86
1317	18	140	83	190	72	250	55
1332	14	90	122	120	106	160	81
Total	16	700	680	930	591	1,240	451

SOURCE: Paul 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1991 and Forest Service, Ketchikan Area, database.

1/ Percentage of current total harvest.

2/ Estimates are based on the entire WAA, including portions outside the Project Area. They are based on predicted harvest levels using 1987-91 average harvest levels, increased by 1.8% per year through 2010 and 1.5% per year thereafter.

3/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and are reduced for road disturbance. Habitat capabilities for 2004 assume Alternative F2 plus an additional 80 MMBF entry. Habitat capabilities for 2024 and 2054 are estimated by reducing 1995 habitat capabilities in the same proportion as the Polk Inlet Project Area reductions between 1995 and 2024/2054.

Table 4-87

Project Area Marten Populations Needed to Support Predicted Total Demand Compared to Habitat Capability Through 2054

WAA	Rural Harvest Percentage[1/]	2004 Needed Pop'n.[2/]	2004 Habitat Capability[3/]	2024 Needed Pop'n.[2/]	2024 Habitat Capability[3/]	2054 Needed Pop'n.[2/]	2054 Habitat Capability[3/]
1107	65	118	268	159	214	208	140
1213	0	135	50	185	42	242	28
1214	62	210	105	306	88	398	58
1317	93	88	71	129	58	168	38
1332	60	15	104	21	84	28	55
Total	56	566	598	800	486	1,044	319

SOURCE: Paul 1992. Data derived from ADF&G Marten Harvest Survey Summary Statistics 1988-1992 and Forest Service, Ketchikan Area, database.

1/ Percentage of current total harvest.

2/ Estimates are based on the entire WAA, including portions outside the Project Area and are based on predicted harvest levels using 1988-92 average harvest levels, which are increased by 1.8% per year through 2010 and 1.5% per year thereafter.

3/ Habitat capabilities are for the entire WAA, including portions outside the Project Area and are reduced for patch size effectiveness. Habitat capabilities for 2004 assume Alternative F2 plus an additional 80 MMBF entry. Habitat capabilities for 2024 and 2054 are estimated by reducing 1995 habitat capabilities in the same proportion as the Polk Inlet Project Area reductions between 1995 and 2024/2054.

These potential decreases in abundance would increase competition for black bear, marten, and the Vancouver Canada goose, all species important for subsistence. However, the abundance of river otter appears to be sufficient to meet subsistence needs in the Project Area through 2054. Fish, shellfish, and other food resources should likewise be available to meet subsistence needs.

Summary Findings for Other Resources

The above analysis leads to the conclusion that the actions proposed in Alternatives F2, 3, 4, and F5 would not produce a significant possibility of a significant restriction on subsistence use of waterfowl, marine mammals, salmon, other finfish, shellfish, or other food resources in the Project Area (Table 4-88). However, a significant possibility of a significant restriction is predicted for marten and black bear under all alternatives. This finding is based on the potential resource effects on two evaluation categories: abundance and distribution and competition (Table 4-88).

Table 4-88
Significant Possibility of a Significant Restriction of Subsistence Use of Other Resources—All Alternatives

	Marten	River Otter	Black Bear	Waterfowl	Fish/ Shellfish	Others
Abundance or Distribution	Yes	No	Yes	No	No	No
Access	No	No	No	No	No	No
Competition	Yes	No	Yes	No	No	No

Note: "No" indicates an insignificant possibility of a substantial effect. "Yes" indicates a significant possibility of a substantial effect.

Other Conclusions

Section 810 (a) (3) of ANILCA (P.L. 96-487, 1980) requires that when a significant restriction may occur, determinations must be made in regard to whether:

(A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of public lands;

(B) the proposed activity will involve the minimum amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition; and

(C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions.

The following section outlines the other subsistence conclusions.

Necessary, Consistent with Sound Management of Public Lands

The alternatives have been examined to determine whether they are necessary, consistent with sound management of public lands. In this regard the National Forest Management Act of 1976, ANILCA, the Alaska Regional Guide, the TLMP, the TLMP 1985-86 Amendments, the 1991 TLMP Draft Revision, the Alaska State Forest Practices Act, and the Alaska Coastal Zone Management Program have been considered.

The ANILCA emphasized the maintenance of subsistence resources and lifestyles. However, the Act also required the Forest Service to make available for harvest 4.5 billion board feet of timber per decade from the Tongass National Forest and left the KPC contract in place. The TTRA removed the 4.5 billion board feet requirement from ANILCA but directed the Forest Service to seek to meet market demand and the market demand for the planning cycle, and left the volume requirements and contract area of the KPC contract in place.
The alternatives presented here encompass four different approaches that would produce the

resources that would best meet the purpose and need of this project. All of the alternatives involve some potential to affect subsistence uses. There is no alternative that would avoid a significant possibility of subsistence restrictions somewhere in the National Forest. Therefore, based on the analysis of the proposed alternatives presented in this document, these actions are necessary, consistent with the sound management of public lands.

Amount of Public Land Necessary to Accomplish the Purpose of the Proposed Action

Appendix A addresses the availability of other lands suitable for timber harvest. Much of the Tongass National Forest is used for deer hunting by one or more rural communities for subsistence purposes. The areas of most subsistence use are the areas adjacent to existing road systems, beaches, and areas in proximity to communities. Within the Project Area, the extent and location of the subsistence use area precludes complete avoidance. Areas other than subsistence use areas that could be harvested may be limited by other resource concerns such as soil and water protection, high value wildlife habitat, economics, visuals, or unit and road design. Effort was taken to protect the highest value subsistence areas. For example, beach fringe is one of the highest use subsistence areas and none will be harvested under any of the proposed alternatives.

The impact of viable timber harvest projects always includes alteration of old-growth habitat, which in turn always reduces projected habitat capability for old-growth-associated subsistence species. It is not possible to lessen harvest in one area and concentrate it in another without affecting one or more rural communities' important subsistence use areas.

Reasonable Steps to Minimize Adverse Impacts Upon Subsistence Uses and Resources

Reasonable steps to minimize impacts on subsistence have been incorporated in development of the alternatives and project design criteria. Project design criteria called for locating roads and units outside of important subsistence use areas such as beach fringe, estuary fringe, and riparian areas adjacent to salmon streams. Road access details, which would protect subsistence resources, are presented in *Transportation and Facilities*.

During development of alternatives, an effort was made to minimize activities that could adversely affect important subsistence use areas. Units were selected to avoid to the greatest extent possible areas with high subsistence use characteristics, such as along roads, rivers and creeks, and beach fringes. In addition to generally avoiding these areas, harvest units were minimized or deferred in many geographic areas with high wildlife and subsistence values (see Landscape Level Mitigation in the *Wildlife* section). Alternatives F2 and F5 were designed to minimize impacts on subsistence use areas and wildlife habitats.

EIS Conclusions

The Record of Decision (ROD) for the Polk Inlet Project will include a final determination about the significant restriction on subsistence use that may result from implementation of the selected alternative. In summary, the potential foreseeable effects from the action alternatives in the Polk Inlet Project do not present a significant possibility of a significant restriction of subsistence uses of deer, river otter, marine mammals, waterfowl, salmon, other finfish, shellfish, and other foods. However, a significant possibility of a significant restriction does exist for marten and black bear. Over the long term, if scheduled timber harvest takes place, then a significant possibility of a significant restriction of subsistence use of deer is likely for Hollis and may occur for Craig, Hydaburg, and Kasaan by 2054.

Hearings

On the basis of findings of this analysis and under the provisions of ANILCA, subsistence hearings were held on the dates, times, and at the seven places announced in the letter accompanying the Draft EIS (see Chapter 1). Letters were sent to the Federal Subsistence Board, Alaska Department of Fish and Game, Regional Fish and Game Advisory Councils, Local Fish and Game Advisory Committees, and to the Post Offices in Craig, Hollis, Hydaburg, Kasaan, Klawock, Ketchikan and Saxman where hearings were held. Announcements were made in newspapers and on the radio. Additional mailings and public notices were made to communities outside of the immediate Project Area but who use subsistence resources. These notifications were made based upon scoping comments received, TRUCS use data, Project interview data, and public and agency suggestions.

Testimony at the hearings was both verbal and written; verbal comments were recorded and transcribed (see Appendix I). Testimony received, both verbal and written, was analyzed and incorporated into the Final EIS. Comments on the Draft EIS and responses and subsistence hearings testimony and responses are provided in Appendices H and I.

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Cultural Resources

Key Terms

Cultural resources—all evidence of past human-related activity, dating from the earliest beginnings to the fairly recent past.
Sensitivity Zone—defined as "high," "medium," or "low," based on the probability that they might contain cultural resources.
SHPO—State Historic Preservation Officer

Introduction

Cultural resources, unlike the timber sought in this proposed action, are nonrenewable resources. Impacts to cultural resources, if not mitigated, can become irreversible and permanent. The baseline cultural resources study identified six cultural resource sites within the greater Project Area (Table 4-90). These six sites have been evaluated for the potential of effects.

Direct and Indirect Effects

Direct impacts are the result of project activities that may directly alter the physical nature of cultural resources. These impacts might include intrusion into a cultural resource through road building or surface alteration from timber harvest activities. None of the previously known or recently discovered resources are at risk from the direct effects of the proposed activity within the Project Area (Table 4-89). Four of the cultural resource sites, 49-CRG-171, 49-CRG-376, 49-CRG-377, and 49-CRG-342, are located within a protected coastal buffer zone; thus, they should be immune to direct effects. One historic site, 49-CRG-044, is located on a Forest Service easement but is completely surrounded by private land that will not be affected by the proposed activity. At the historic site, 49-CRG-017, the townsite is adjacent to a pre-existing road within the protected coastal buffer zone, but the mine is in an upland location that is more distant to any potential activity.

Table 4-89
Effects on Cultural Resources

Alaska Heritage Resource Survey (AHRS) #	Potential Direct Effects	Potential Indirect Effects	Potential Nearest Action (mi.)	Proposed Action
49-CRG-171	None	High	0.1	Harvest Unit 618-209
49-CRG-376	None	Low	2.3	New access road
49-CRG-377	None	High	0.15	Harvest Unit 618-216
49-CRG-017	None	High	0.2	Existing road
49-CRG-044	None	Low	1.35	New access road, Harvest Unit 674-283
49-CRG-342	None	High	0.25	Harvest Unit 619-246

SOURCE: Alaska Heritage Resource Survey 1986
1/ Eligible for the National Register of Historic Places.

Indirect impacts are the result of indirect actions by persons associated with the proposed activities. Indirect effects may include unauthorized visitation to a cultural resource, heavy pedestrian traffic over a fragile resource, souvenir hunting, or worse, site disturbance through illegal looting. Sites may also be altered through careless substance handling that changes the chemical composition of site components, such as a nearby upslope fuel spill that would render later radiocarbon or aspartic acid dating determinations erroneous.

Sites are frequently considered at risk of indirect impact based on proximity to proposed activities. Sites that are within easy access distance to project activity are at high risk. Indirect effects can be anticipated for cultural resources (Table 4-89). Of the six sites documented in this baseline study, two sites considered eligible for the National Register of Historic Places, 49-CRG-171 and 49-CRG-377, are close to potential harvest units (Table 4-89). Two sites considered not eligible for the National Register, 49-CRG-017 and 49-CRG-342, are also in proximity to similar potential activities (Table 4-89).

Based on the field effort, data recovery, and consideration of all proposed alternatives during the baseline cultural resources study coupled to identified harvest units and potential access routes, the following effects can currently be anticipated:

Alternative 1

No action taken will result in no effect to cultural resources.

Alternative 1a

No action taken and no harvest will result in no effect to cultural resources.

Alternative F2

Due to the proximity of a harvest unit and access road (within 1.35 miles), there could be indirect effects, if not mitigated, to 49-CRG-044.

Alternative 3

No action will occur at or close to known cultural resource sites; thus, there should be no direct or indirect effects.

Alternative 4

Due to the proximity of a harvest unit (within 0.1 mile) to 49-CRG-171 and a harvest unit and access road (within 1.35 miles) to 49-CRG-044, there may be indirect effects, if not mitigated.

Alternative F5

No action will occur at or close to known cultural resource sites; thus, there should be no direct or indirect effects.

Cumulative Effects

Cumulative effects to cultural resources are most difficult to determine. The cultural resource record is cumulative and finite; thus, if cultural resource sites are avoided and protected utilizing the appropriate mitigation measures, there should be no cumulative effect to the record of cultural resources. If the proposed activities result in damage to cultural resources, the cumulative record is affected.

Mitigation and Monitoring

Depending on the harvest unit and access requirements within each sale, mitigation and monitoring are recommended for those cultural resource sites deemed at high risk for potential indirect effects from timber harvest activities (Mitigation Measure C1). There are several steps that mitigation and monitoring policies would initiate, including the following:

- Notification or coordination with presale and sale administration instilling mitigation and monitoring requirements;
- Appropriate protection, including mitigation and monitoring clauses, in each sale contract;
- Strict policies of cultural resource avoidance for personnel involved in timber harvesting, including the enforcement of Archaeological Resources Protection Act of 1979 (ARPA) penalties for offenders;
- Environmental training for personnel that includes cultural resource awareness and the necessity of protecting these heritage sites;
- Fuel spill contingency planning that includes protection of cultural resources from petroleum contamination and the actions of spill cleanup workers;
- Periodic monitoring of cultural resources during harvest activities by an archaeologist;
- Detailed salvage investigation of cultural resources if sites become endangered during a harvesting activity; and
- Possible additional study of cultural resources, whether eligible or not eligible, for the National Register of Historic Places, to secure their interpretive value.

The forest-wide monitoring proposed in the TLMP Draft Revision (1991a) includes effectiveness monitoring for cultural resources. This activity includes field monitoring to verify that cultural resource sites are being protected from damage by human activities or natural forces (Cultural Monitoring Item 1).

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Visual Resources

Key Terms

Background—the distant part of a landscape; the seen, or viewed area located from approximately 3 miles to infinity from the viewer.
Character type—an area of land that has common distinguishing visual characteristics of landform, rock formations, water forms and vegetative patterns.
Characteristic landscape—usually a small portion of a character type that visually represents the basic vegetative patterns, landforms, rock formations and water forms which are in view.
Cumulative visual disturbance—the percent of a viewshed's seen area in a disturbed condition at any point in time.
Distance zone—divisions of a viewed landscape by foreground, middleground, and background zones.
Foreground—portion of viewed area from immediately adjacent to the viewing position to about a half mile from the observer's position; individual branches of trees are discernible.
Maximum Modification—a visual quality objective (VQO) which prescribes that an area may be dominated by management activities, but resulting visual characteristics should appear as a natural occurrence when viewed from the background distance zone.
Middleground—the visible terrain beyond the foreground from about _ mile to approximately 3 miles from the observer's position; individual trees are still visible but do not stand out distinctly from the landscape.
Modification—a VQO in which management activities may visually dominate the original characteristic landscape, but resulting visual characteristics must resemble natural occurrences within the surrounding area when viewed from the foreground and middleground distance zone.
Not seen—a mapping category associated with distance zones. Sensitivity Level 3 travel routes, use areas, and areas not seen or seldom seen from Visual Priority Routes and Use Areas have been mapped as Not Seen in the visual inventory. Also referred to as "Seldom Seen."
Partial Retention—a VQO in which management activities are to remain visually subordinate to the natural landscape.
Preservation—a VQO which permits ecological changes only; applies to wilderness areas and other special classified areas.
Retention—a visual quality objective which provides for management activities that are not visually evident to the casual observer.
Sensitivity level—a three-level measure of people's concern for the scenic quality of an area.
Unacceptable Modification—does not meet a VQO of Maximum Modification. Excessive modification due to management activities in which the design, size, extent, or duration are poorly related to the scale of landform and vegetative patterns in the characteristic landscape may result in unacceptable modification.
Variety class—classification of the landscape by the diversity and scenic quality of the natural landscape. The three classes are: Class A - Distinctive; Class B - Common; Class C - Minimal.
Viewshed—a defined landscape or panoramic vista seen from one or more specific viewpoints.
Visual Absorption Capacity (VAC)—an estimate of the relative ability of a landscape to absorb alteration yet retain its visual integrity.
Visual priority routes and use areas—the designated priority routes and use areas from which the proposed VQOs will be applied. Nonpriority travel routes and use areas, and those areas not seen from the Visual Priority Routes and Use Areas, are managed according to "Not Seen" criteria.
Visual Quality Objective (VQO)—management standards reflecting five degrees of acceptable alteration of the natural landscape based on a landscape's diversity of natural features and the public's concern for scenic quality.

Introduction

Timber harvest activities have a number of potential effects on the visual resources of an area. The effects are influenced by factors such as harvest methods, transportation, unit design, and silvicultural prescriptions. In general, environmental effects can be described as affecting the form, line, color, and texture of a viewed landscape. In this chapter, the potential visual contrasts caused by harvest activities are related to the affected environment described in Chapter 3.

Each numbered photopoint is discussed with respect to the adopted and draft Visual Quality Objectives (VQO's), the standards and guidelines from the TLMP Draft Revision for visual resources, and the Future Visual Condition (FVC) that would result at the end of this harvest period. The view models depict the alternative which would result in the greatest amount of alteration of the landscape. The direct and indirect effects are followed by a discussion of cumulative visual impacts. Factors considered in cumulative effects include management activities on adjacent non-Forest Service land, alterations such as roads, log transfer facilities, previous adjacent harvest, and age of second growth. Whether a unit is visible from more than one viewpoint is also considered. See Figure 3-28 for a listing of photopoints and associated visual criteria.

Mitigation measures for viewed areas are discussed and suggestions are made for monitoring the effectiveness of those measures. Perspective plots show the proposed harvest units with proposed mitigation measures.

Direct Effects

Twelvemile Arm Viewshed

The Twelvemile Arm Viewshed was subdivided into three sections for analysis. The northern part of the Arm, at the mouth and in the vicinity of the ferry route, ferry terminal, and Hollis, is one section. The middle part of the Arm, which is not accessible by road at this time, is the second section. The southern part of the arm, in the vicinity of the proposed campground and cabin and where the road currently ends on the east side of the Arm, defines the third section. Figure 4-31 shows the photopoints and their view orientations, the distance zone, and potential harvest units for this viewshed.

The discussion follows the same ordering of photopoints as in Chapter 3. Refer to Figure 3-28 for a map of the photopoints.

Ferry Route Near Hollis (Photopoint 1)

Five harvest units are proposed for the Scenic Viewshed portion of the viewshed south of the ferry route. They are 611-201, 204, 207, 214 and 215 (Figure 4-32). Two other units, 612-211 and 621-293, span the boundaries of VCU 611 into VCU's 612 and 621, both of which are in Timber Production LUD's.

The VQO's for the Scenic Viewshed are Retention for foreground and Partial Retention for middleground. It is Maximum Modification for middleground in the Timber Production land use designation.

Alternatives 1 and 1a—The Existing Visual Condition (EVC) of the Scenic Viewshed is slightly altered (III) in a band along the shoreline, and natural condition (I) on the slopes above to the ridge line. No additional harvest is proposed for this viewshed under these No-Action Alternatives. The VQO's are met under existing conditions.

Figure 4-31
Map of Twelvemile Arm Viewshed

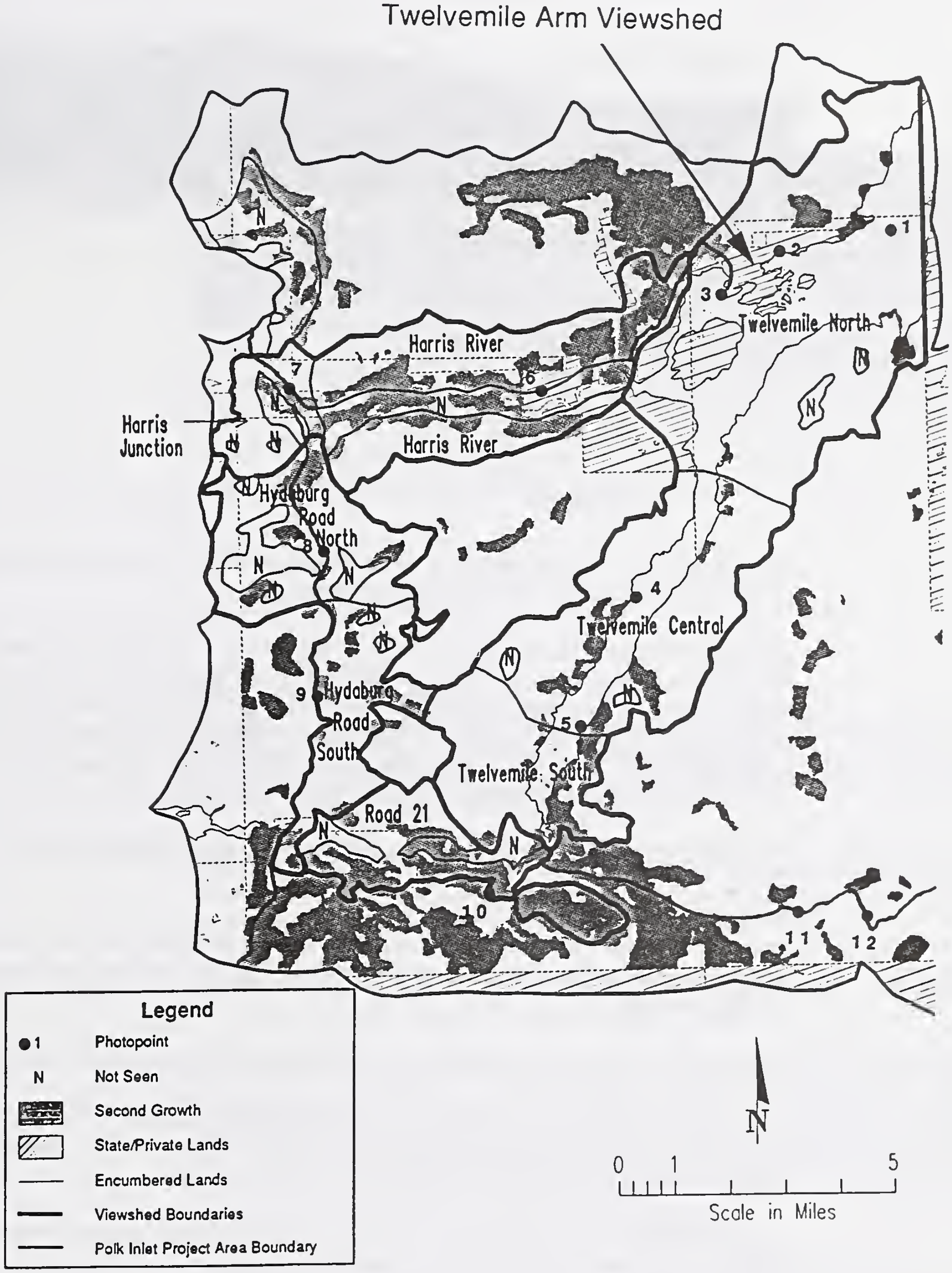
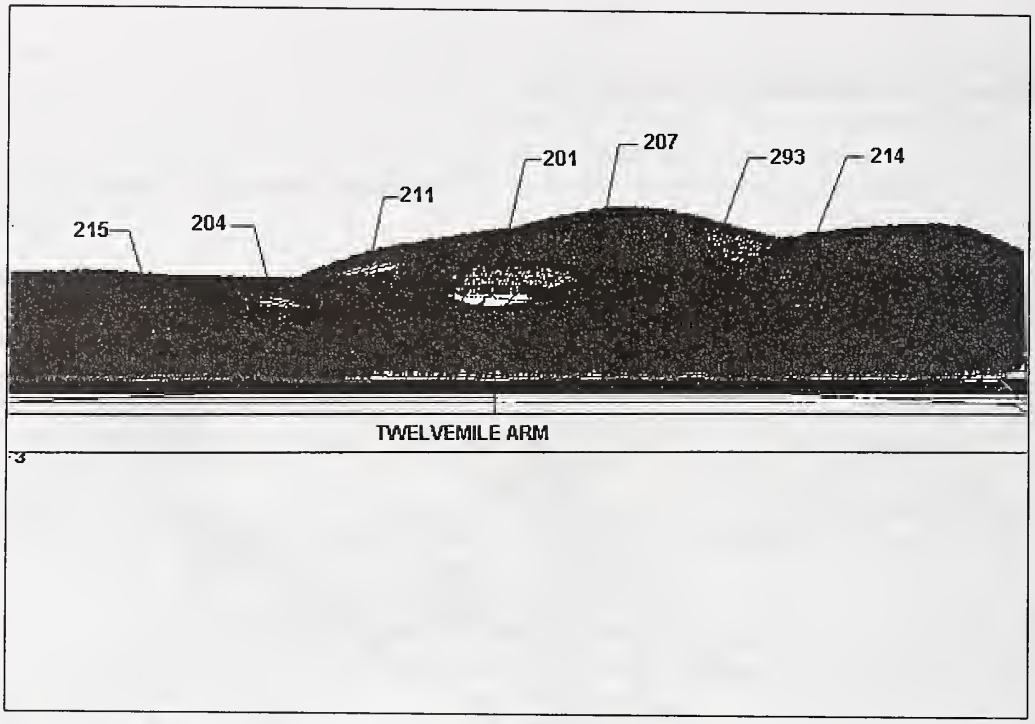


Figure 4-32
Photopoint 1 from Ferry Route Near Hollis



Alternatives F2, 4, F5—There are no units or roads proposed under these alternatives. The effects would be the same as the No-Action Alternatives.

Alternative 3—Under this alternative, three of the seven units would not be visible because of their location on the flattest slopes on the north side of the headland near the mouth of Twelvemile Arm. The remaining four units (612-211, 611-201, 612-204 and 621-293) would meet the VQO's of Partial Retention in the Scenic Viewshed and Modification in Timber Production as they would appear subordinate to the characteristic landscape. The top part of Unit 201 and all of 293 are partial cuts. The access road would not be evident.

The natural condition (I) EVC would change to a slightly altered condition (III) FVC.

Ferry Terminal (Photopoint 2)
The VQO's from this viewpoint are Partial Retention for the visible portion of the Scenic Viewshed, and Maximum Modification for the balance of the viewshed which is designated for Timber Production.

Three units, 611-201, 611-204 and 620-293 (Figure 4-33) are proposed for this viewshed.

Alternatives 1 and 1a—The EVC is slightly altered (III) along the shoreline across Twelvemile Arm from the terminal, and natural condition (I) on the slopes where the proposed units are. The FVC would remain the same.

Alternatives F2, 4, F5—None of the proposed units are included in these alternatives. The VQO would be met and the FVC would remain the same.

Alternative 3—The most visible unit from this photopoint is 611-204 in the Scenic Viewshed. The view of this unit is over the east end of Loy Island. The greatest contrast will be from

the light-colored soil and shrubby vegetation in the early years after harvest. From a distance of 2 miles, the viewed units are subordinate to the characteristic landscape and the VQO of Partial Retention will be met from this viewpoint. The FVC would change to III.

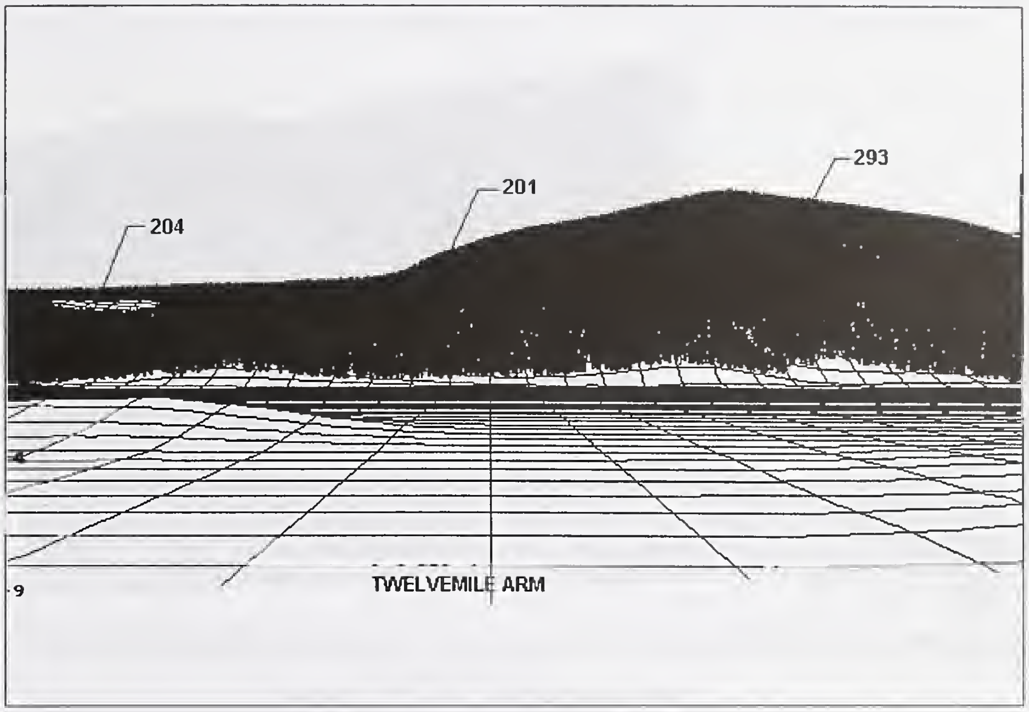


Figure 4-33
Photopoint 2, Twelvemile Arm from Hollis Ferry Terminal, Alternative 3

Hollis Area (Photopoint 3)

The VQO's from this viewpoint are Partial Retention for the visible portion of the Scenic Viewshed. For the Timber Production portion of the viewshed, the VQO's are Modification for the foreground, and Maximum Modification for middleground. Most of the viewshed is in VCU 621 which is a Timber Production LUD.

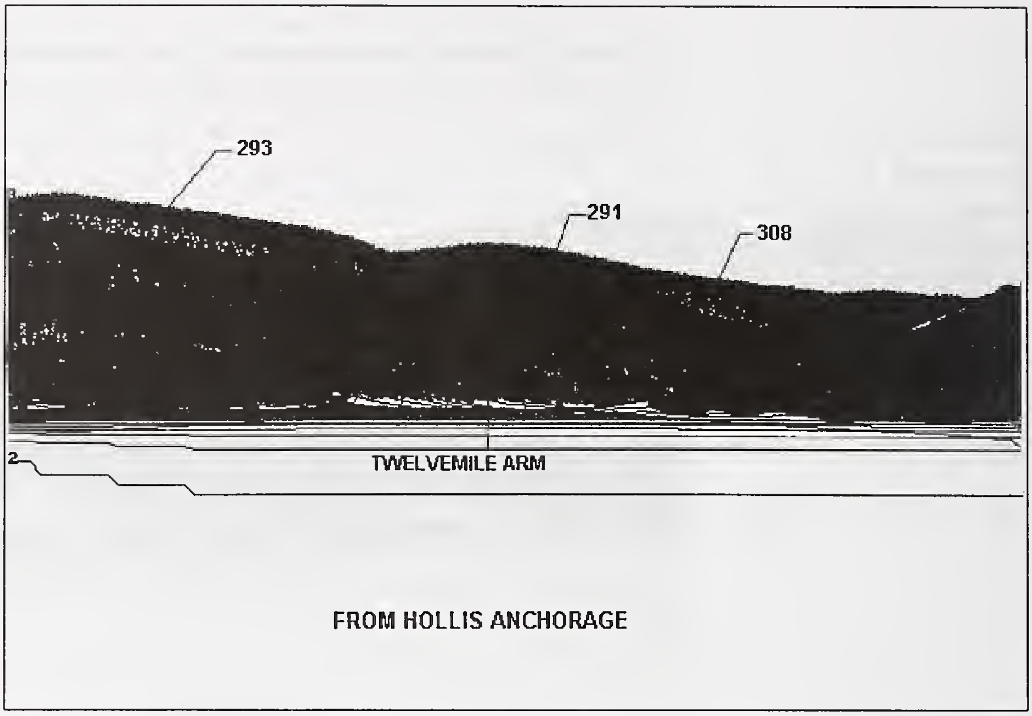
Alternatives 1 and 1a—The EVC is slightly altered (III) along the shoreline across Twelvemile Arm from the terminal, and untouched, (I) on the slopes above. The FVC would remain the same. The view from this photopoint meets the VQO.

Alternatives F2, 4, F5—None of the proposed units are included in these alternatives. The VQO would be met and the FVC would remain the same.

Alternative 3—The most visible unit from this photopoint is VCU 621-293 (Figure 4-34) at the top of the ridge directly across Twelvemile Arm from this photopoint. The unit would be located high on the ridge near the horizon line, but it will be a partial cut, helicopter logged unit. Unit 621-291 (Figure 4-34) is on a flatter slope and angled away from the viewer. A portion of 621-308 (Figure 4-34) will be visible over the end of Cat Island. It is a partial cut to be logged by helicopter, minimizing visual impacts.

The units in the Timber Production LUD would meet the Modification VQO from this viewpoint. The FVC would change from untouched on the upper slopes to a moderately altered condition (IV).

Figure 4-34
Photopoint 3, from Hollis Anchorage, Alternative 3



Mid Twelvemile Arm (Photopoint 4)

The VQO's for both sides of the inlet are Modification for foreground and Maximum Modification for middleground. The LUD is Timber Production.

Alternatives 1 and 1a—Part of the middle section of the inlet is old-growth forest in an untouched (I) EVC. The untouched condition is on the slopes above the slightly altered (III) band along the shoreline on the east. On the west side where there was previous harvest activity along the saltwater, the EVC is slightly altered (III) from the head of the inlet to approximately even with this photopoint. On the west side of the inlet, the EVC is untouched (I) from the shoreline to the ridge line. Under these alternatives, the EVC would remain the same and the VQO's would be met.

Alternative F2—There are four units potentially visible under this alternative, all on the east side of the inlet. Units 621-259, 261, 262, and 264 all are located high on the east slopes along the inlet. From this viewpoint (Figure 4-35), Unit 621-262 has a small-scale visual impact. Units 621-259, 261, and 264 all have boundaries on the horizon line and are in a superior position to the viewer, making evident their contrast in line, color, and texture with the characteristic landscape. All of the units provide contrast in form, as all are angular openings in an otherwise closed tree canopy. Units 621-259 and 264 are in the foreground and 261 is in the middleground.

The proximity of the large units on the east introduces a large amount of contrast in form, line, color, and texture in a landscape of steep slopes and uniform texture. The VQO's of Modification in the foreground will require mitigation measures for Unit 621-264, which will introduce a highly visible contrast in form, line, color, and texture. Roads do not cross the unit, alleviating visual effects of road construction. Maximum Modification in the middleground will be met through application of mitigation techniques discussed in a later section.

Unit 255, at 94 acres, is larger than the typical 50- to 75-acre clearcut recommended in the Forest Plan standards and guidelines for an area with Maximum Modification VQO and low VAC. Unit 254 is about 20 acres, and would be visible from the head and middle of the Arm. Because the other units are largely screened by topography, the VQO is met from this viewpoint. The FVC would change to heavily altered (V) due to the visibility of the units from other viewpoints.

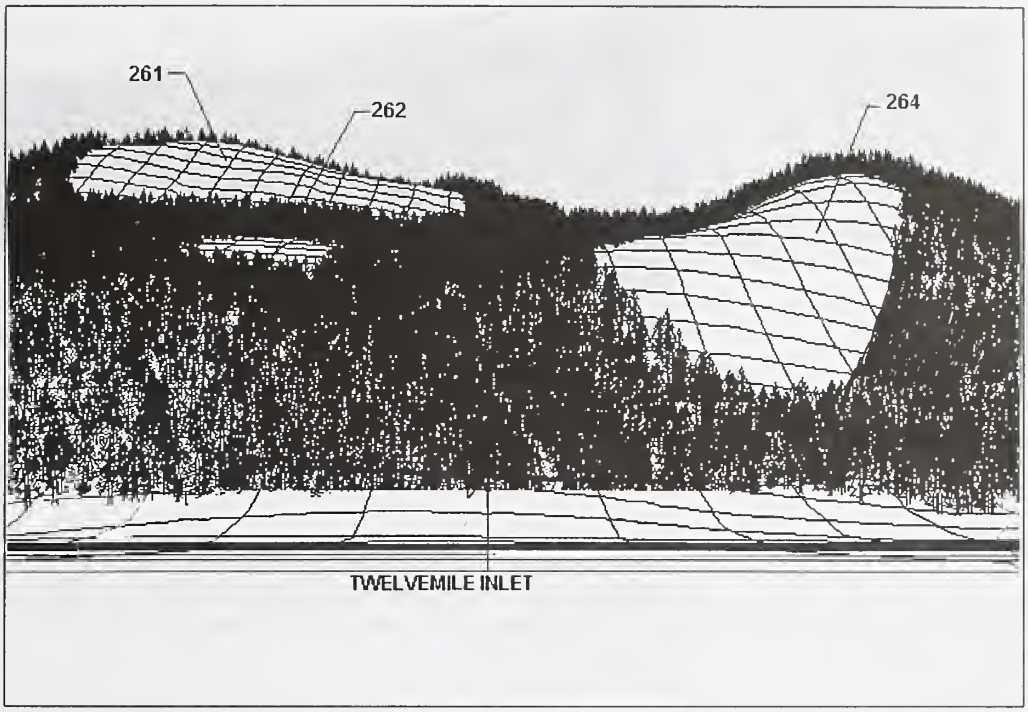
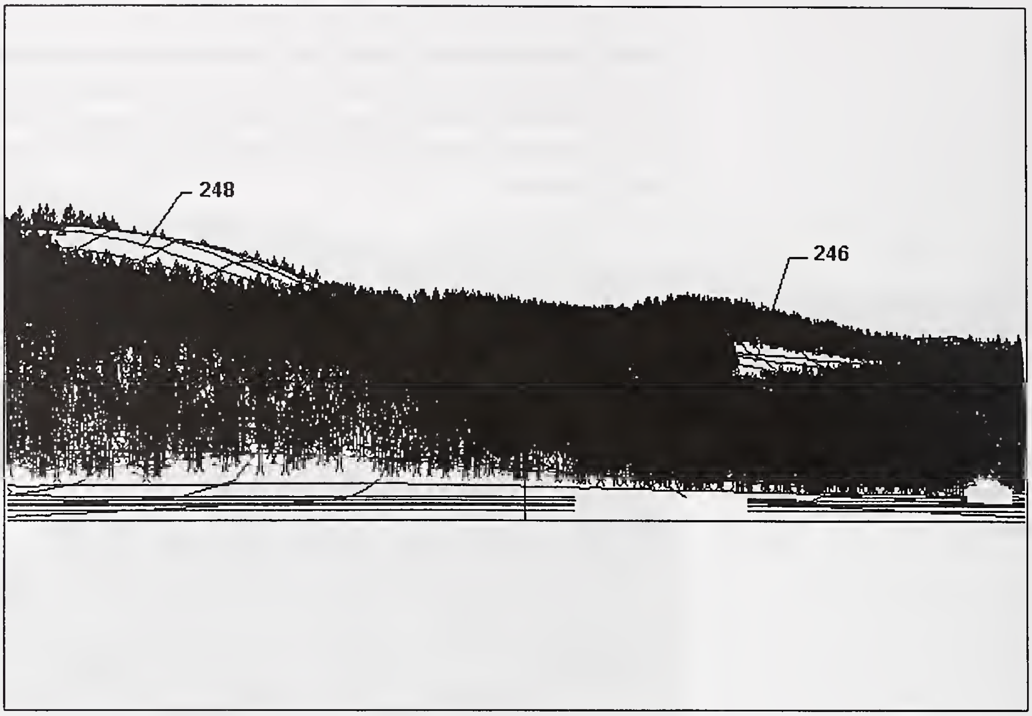


Figure 4-35
Photopoint 4b, from Mid Twelvemile Arm, Alternatives F2, 3, 4, F5

Alternative 3—Sixteen units are potentially visible under this alternative. Both sides of the inlet would have substantial harvest activity. On the east side the proposed units are 621-259, 261, 262, 264, 299, 308, 310, and 311. On the west side the units are 621-246, 248, 250, 251, 252, 254, 255, and 258. The units with the greatest visual effects are those closest to the viewer position and those on slopes facing the viewer. Mitigation measures will be required to meet VQO's.

Not all of the units would be visible from any one viewpoint. Persons moving through the inlet on the water would experience a succession of visual effects because of timber harvest. The cumulative visual disturbance of the viewshed is approximately 18 percent. The TLMP Draft Revision suggests that cumulative visual disturbance should not exceed 15 percent for areas of Modification VQO and Low VAC, or 50 percent for areas of Maximum Modification and Low VAC. The proposed activities are within that range. VQO's would be met. The FVC would range from moderately altered (IV) on the northeast end of the inlet to heavily altered (V) for the majority of the inlet. The level of alteration will be very evident, with the cumulative disturbance perceived by viewers moving through the landscape. This alternative introduces a level of alteration that approaches the limit of Maximum Modification.

Figure 4-36
Photopoint 4i, from Mid Twelvemile Arm, Alternatives F2, 3, 4



Alternative 4—This alternative is similar to Alternative 3, minus the four northern-most partial cut units on the east side of the inlet, 621-299, 308, 310, and 311 (Figures 4-37 and 4-38). These units are the least visually intrusive. The FVC would be heavily altered (V) for the rest of the inlet.

Alternative F5—This alternative is similar to Alternative F2, minus Unit 621-259, which was discussed under Alternative F2. The VQO's would be met and the FVC would change to heavily altered (V) only toward the southeast end of the inlet around Harvest Units 621-261, 262, and 264.

Head of Twelvemile Arm (Photopoint 5)

There are two LUD's in this area. The end of the inlet, around the estuary, is designated as Modified Landscape. The VQO's for this area are Partial Retention for foreground and Modification for middleground. No units are proposed within this LUD.

On either side of Twelvemile Arm, toward its mouth, the LUD is Timber Production. The VQO's are Modification in the foreground and Maximum Modification in the middleground. Five proposed units potentially are visible from this viewpoint. They are Units 621-254, 255, 258, 266, and 268.

Alternatives 1 and 1a—The EVC's at the head of the inlet are heavily modified (V) along the east side and slightly altered (III) along the west side. The alterations on the east side resulted from extensive cutting in 1960 and into the mid-1970's. A former LTF with a rock fill area at the shoreline and at least one staging area are other visible alterations both from the road and from the water. Moving north, the EVC changes to slightly altered (III) along the inlet and to untouched (I) on the slopes.

Figure 4-37
Photopoint 4, from Mid Twelvemile Arm, Alternative 3

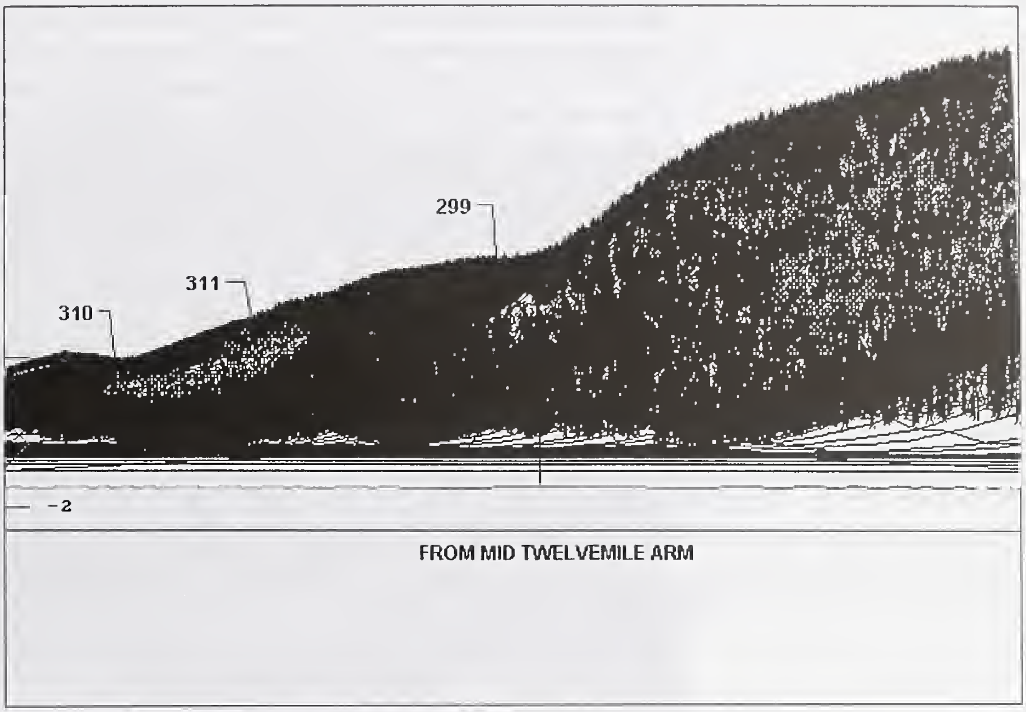
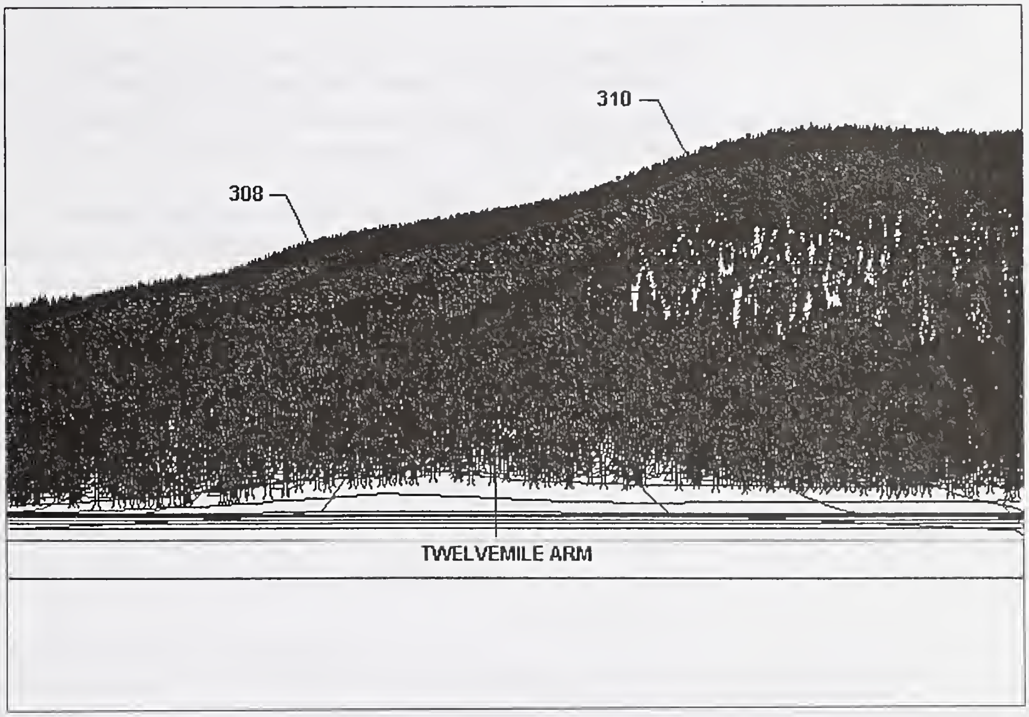
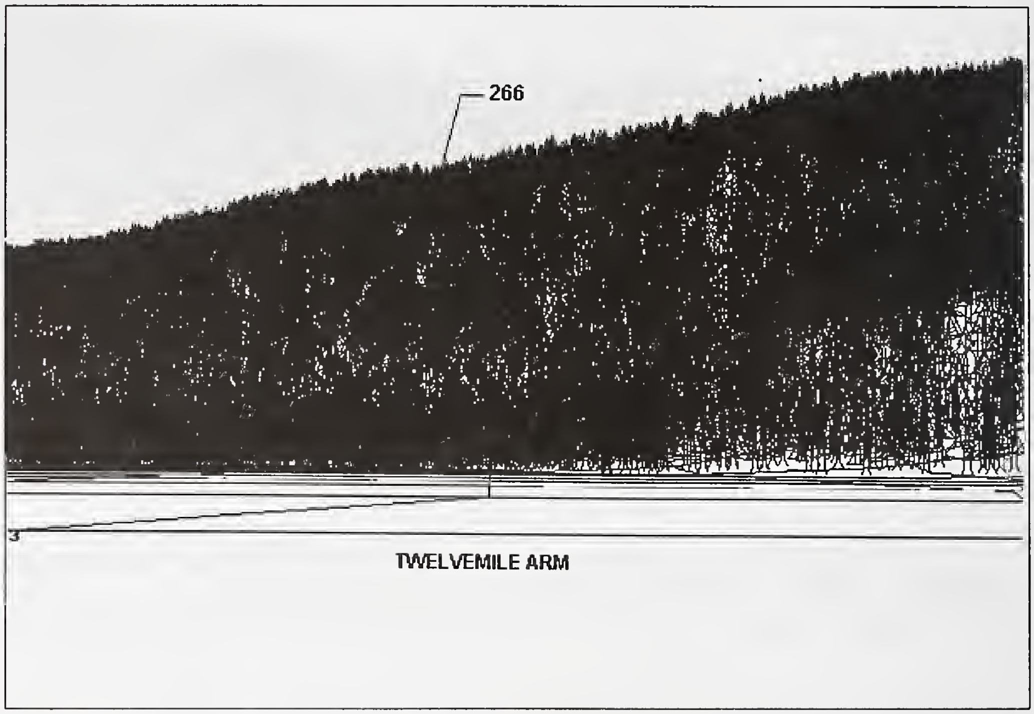


Figure 4-38
Photopoint E, from Mid Twelvemile Arm, Alternative 3



Alternatives F2 and F5—Unit 621-266 (Figure 4-39), on the eastern slope of the inlet, is the only one in these alternatives. Because of topographic relief and the viewing angle, the unit would not be visible from the proposed campground or the middle of Twelvemile Arm west of the abandoned LTF. The VQO is met. The EVC is untouched (I) on the slopes where this unit is proposed, but would still appear to be unaltered from this viewpoint.

Figure 4-39
Photopoint 5, Twelvemile Arm, Alternatives F2, 3, 4, F5



Alternatives 3 and 4—A total of five units are included in both these alternatives. The effects of harvesting 621-266 are the same as described under Alternatives F2 and F5. The other four units are on the west side of the inlet. All the units are in an area described as slightly altered (III) EVC. From south to north, the units are 621-268, 258, 255 and 254.

Units 621-258 and 268 (Figure 4-40) are partially screened by topography from this photopoint. Units 255 and 254 are partially visible from this viewpoint. They are more visible from the viewpoints farther north in Twelvemile Arm.

Hollis-Klawock Highway Corridor Viewshed

Because most units in the corridor were deferred during this entry, only two photopoints were selected for analysis. These are the only two viewpoints from within the corridor where potential harvest units are visible. Figure 4-41 shows the photopoints and their view orientation, the distance zone and potential harvest units.

Figure 4-40
Photopoint 5, from Head of Twelvemile Arm, Alternatives 3, 4

Hollis-Klawock Highway Overlook (Photopoint 6)

The Harris River Valley, including the corridor along the highway, is a Modified Landscape LUD under the proposed revisions to the TLMP, and a main line road under the current Forest Plan. For the immediate portion of the viewshed, the VQO is Partial Retention for foreground and Modification for middleground. The VQO's are different for the long distance view to the east side of Twelvemile Arm. Most of the long distance viewshed is of VCU 621, which is LUD IV, and a proposed Timber Production LUD. The VQO's are Modification for foreground and Maximum Modification for middle and background.

Alternatives 1 and 1a—The EVC is slightly altered (III) along the shoreline across Twelvemile Arm, and untouched, (I) on the slopes above. The FVC would remain the same. The current view from this photopoint meets the VQO of Partial Retention.

Alternatives F2, 4, F5—None of the proposed units are included in these alternatives. The VQO would be met and the FVC would remain the same.

Alternative 3—Under this alternative, six cutting units would be visible in the background distance zone from this photopoint. All six are in VCU 621. From north to south they are 291, 293, 307, 308, 310 and 311 (Figure 4-42). Three of the units, 307, 310, and 311, are somewhat screened by topography and vegetation. All the units except 291 will be partial cut, helicopter yarded, thus minimizing visual impacts.

The EVC would change from I to a FVC range of slightly (III) to moderately altered (IV). The VQO of Maximum Modification will be met.

Harris Junction (Photopoint 7)

This photopoint is on the Hollis-Klawock Highway, just west of the intersection of the Hydaburg Road. The VQO from this photopoint is Maximum Modification in the vicinity of the proposed harvest units under the TLMP Draft Revision. The draft VQO's permit a more altered condition than the current Forest Plan, which gives a range of VQO's from Retention to Modification along main line roads.

Figure 4-41
Map of Hollis-Klawock Highway Corridor Viewshed

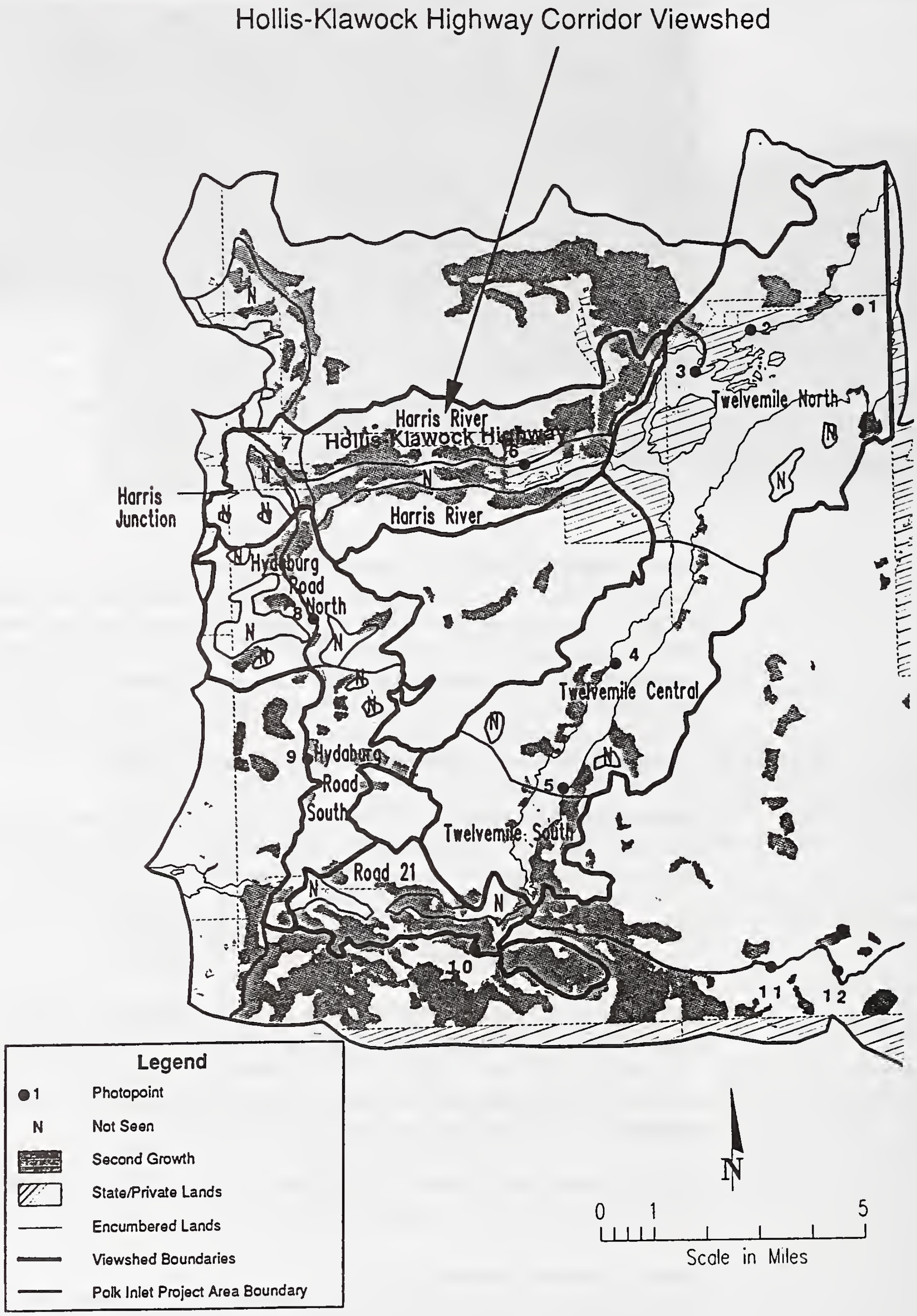
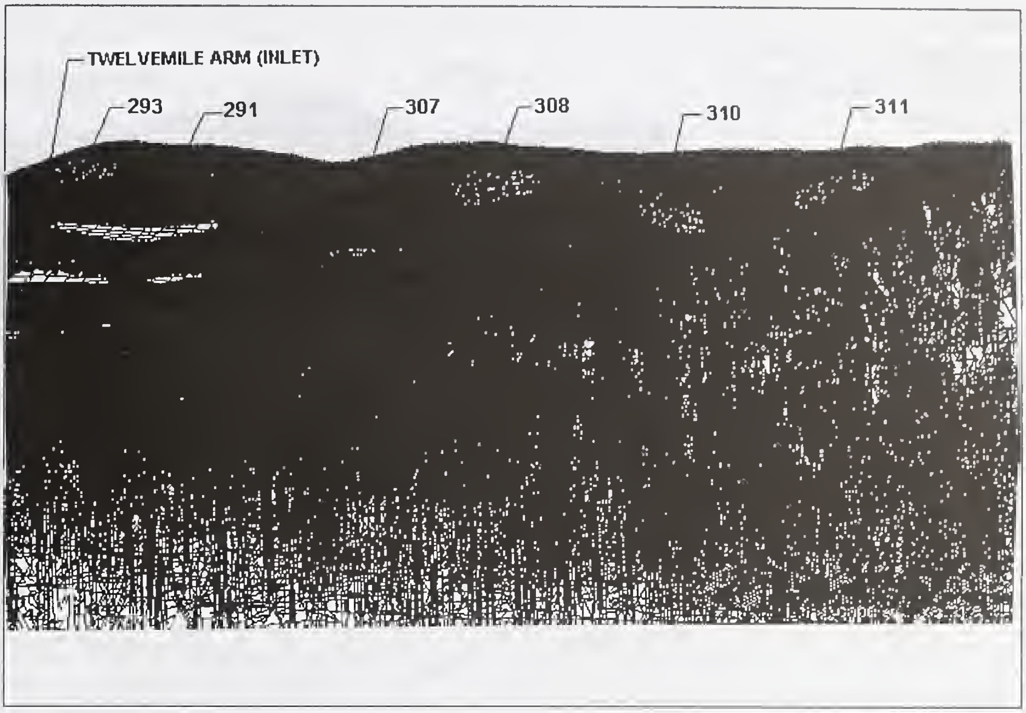


Figure 4-42
Photopoint 6, Overlooking Twelvemile Arm, Alternative 3



Alternatives 1 and 1a—Under the No-Action Alternatives the EVC's would remain the same and the VQO would be met. The EVC's are untouched (I) on the slopes south of the viewpoint and moderately altered (IV) between the road and the hills to the south.

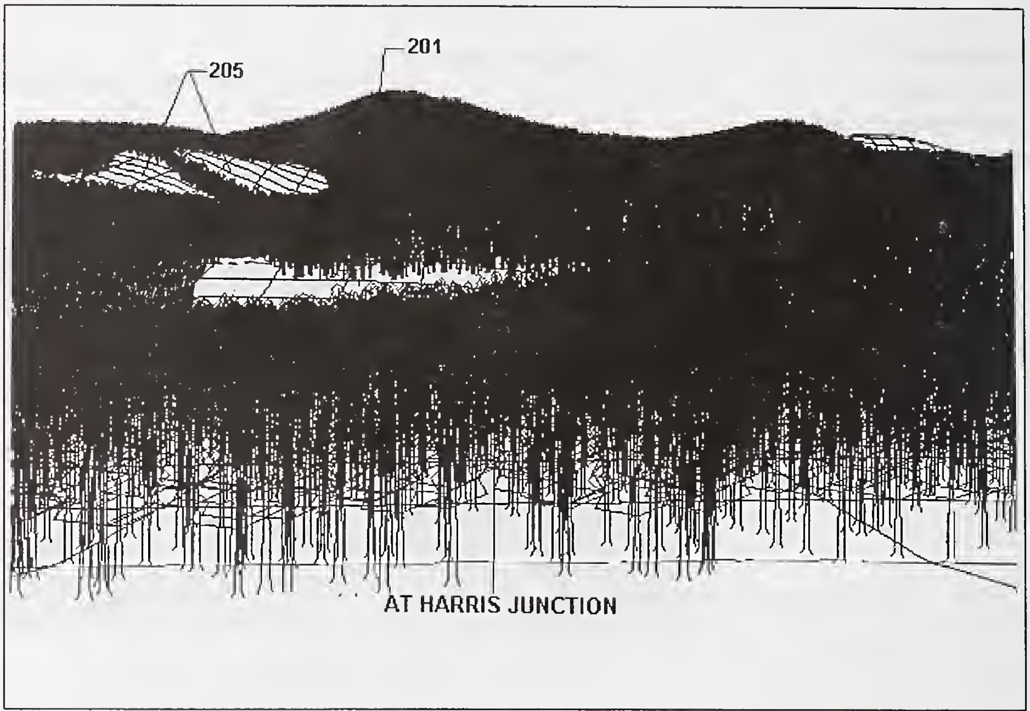
Alternatives F2, 3, F5—Two units, VCU 622-201 and 205 (Figure 4-43), would be harvested under these alternatives. Unit 201 is inferior to the viewer position from the photopoint and is partially in an area of intermediate Visual Absorption Capacity (VAC) because of a low point in the topography. Only the upper portion of the unit would be visible, if the foreground vegetation remains intact. Unit 205 is at the top of the hill and because of its position in the landscape, is much more visible. Unit 205 is a two-part unit which breaks up the shape of the clearcut. Both units are to be helicopter yarded, thus reducing the visual effects of roads and landings. The FVC would best be described as moderately altered (IV). Mitigation measures have been incorporated into the design and prescriptions for these units so that they meet the VQO of Modification for mainline road viewsheds as directed by the current Forest Plan (see Mitigation section).

Alternative 4—Neither of the units is included in this alternative. The effects would be the same as described under Alternatives 1 and 1a.

Hydaburg Road Corridor Viewshed

Two units within this corridor were deferred due to cumulative visual disturbance concerns. Figure 4-44 shows the location of the photopoints, their view orientation, the distance zone, and potential and previously harvested units.

Figure 4-43
Photopoint 7 at Harris Junction, Alternatives F2, 3, F5



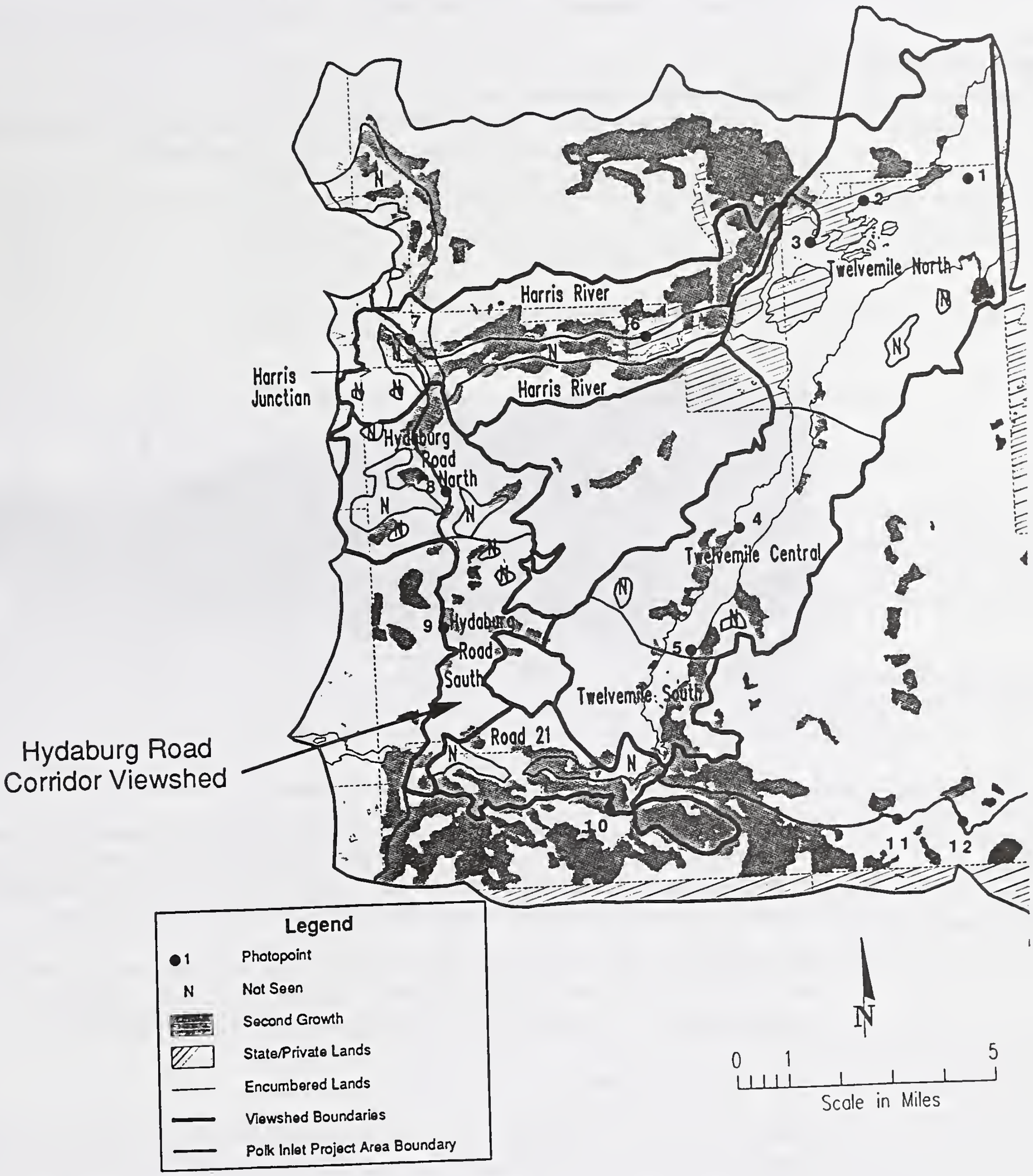
One Duck Lake and Trailhead (Photopoint 8)
A unit planned for the narrow Timber Production area between two small Scenic Viewsheds was deferred because of the cumulative visual disturbance it would have created in the foreground along with a large unit cut in 1987. The combined cumulative visual disturbance in the small viewshed exceeded the 15 percent suggested in Forest Plan proposed revisions of standards and guidelines for areas of Modification and low VAC.

Hydaburg Road (Photopoint 9)
Most of the Hydaburg Road corridor is designated for Timber Production. In the foreground, the VQO is Modification, and in the middleground it is Maximum Modification. The road corridor viewshed has been affected by previous harvest in 1981 and 1987. Approximately 30 percent of the foreground viewshed along a 1.5 mile segment of road would be affected if VCU 624-256 were harvested. Additional harvest would result in effects beyond the Modification VQO, thus the harvest was deferred.

Unit 624-201 is adjacent to the Hydaburg Road, a mainline road and Visual Priority Route. This unit is just north of Forest Road 21 in a section of road corridor not as greatly affected visually by recent harvest activities. However, harvest of this unit will add to the cumulative visual disturbance along this route.

Alternatives 3 and 4—Unit 624-201 is included in these alternatives. Extensive mitigation measures have been incorporated into the design prescriptions in order to meet a modification VQO (see Mitigation section).

Figure 4-44
Hydaburg Road Corridor Viewshed



Forest Road 21 Corridor Viewshed

One viewpoint, with long-distance views to the east and the slopes above Twelvemile Arm, was selected as a photopoint for the visual analysis. Refer to Figure 3-28 for the photopoint location.

Forest Road 21 (Photopoint 10)

The VQO for the seen area is Maximum Modification. Two units, 621-207 and 208, (Figure 4-45), would be visible from the photopoint on this Visual Priority Route.

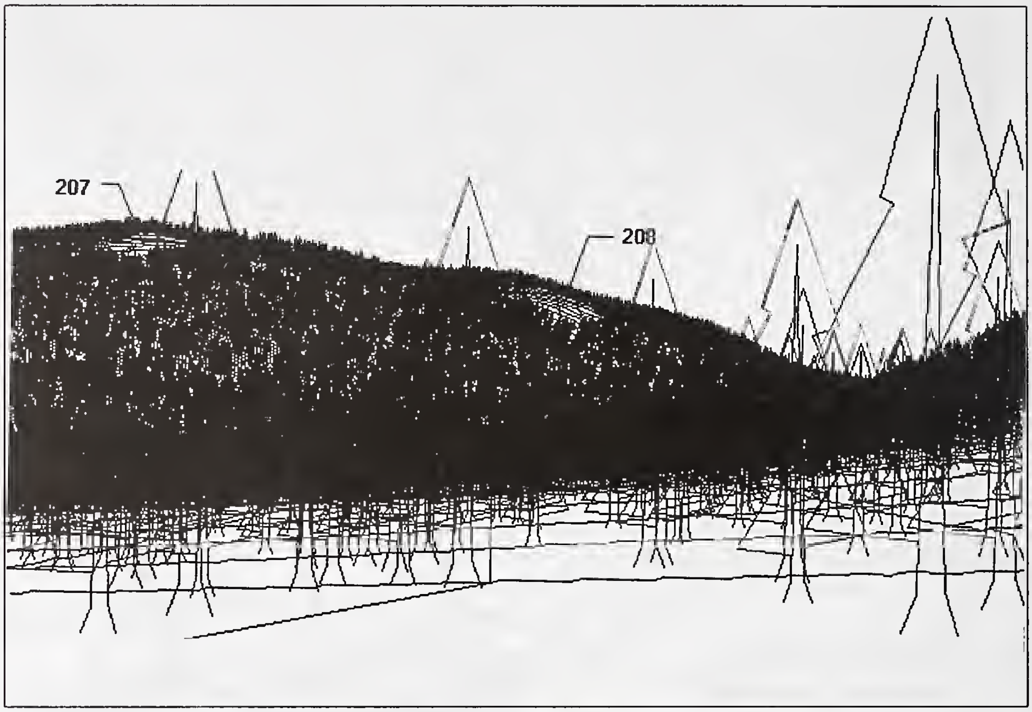


Figure 4-45
Photopoint 10, from Forest Service Road 21, All Alternatives

Alternatives 1 and 1a—The EVC's are moderately (IV) and heavily (V) altered in the vicinity of the proposed units. The EVC reflects the amount of harvesting that was done in the area in 1958, 1960, and 1966, and proposed harvest until 1994. The second growth is tall enough that it screens cutting that was done in the area. The VQO is met under these alternatives.

Alternatives F2, 3, 4, F5—Both units are included in all the action alternatives. Both are at the top of a ridge where the topography flattens. Both would be partially screened by foreground trees. The proposed units will meet the Maximum Modification VQO.

Forest Road 21 Corridor

Forest Road 21 east of Twelvemile Arm is not a Visual Priority Route. The Project Area east of Twelvemile Arm and north of the West Arm of Cholmondeley Sound is considered Sensitivity Level 3 and is mapped as not seen. This area is largely LUD IV and proposed Timber Production under the TLMP Draft Revision. Consequently, the area's management direction relates primarily to timber values. The viewpoints were included because all National Forest System lands must meet a minimum VQO of Maximum modification.

Pass Lake - Forest Road 21 (Photopoint 11)
The VQO for the seen area is Maximum Modification. Unit 620-248 is proposed for harvest; another unit was deferred. This portion of Forest Road 21 is not designated a Priority Travel Route.

Alternatives 1 and 1a—The EVC for this viewshed is heavily altered (V). Substantial cutting occurred in the area as recently as 1988. The middleground VQO of Maximum Modification is met from this photopoint.

Alternatives F2, 3, F5—A foreground unit was deferred, leaving one small unit, VCU 620-248, on the hillside above Pass Lake. Although the area has been heavily altered, the effects of the additional small unit are within the proposed Forest Plan Revision standards and guidelines for cumulative visual disturbance. Maximum Modification is met.

Alternative 4—The unit is not included in this alternative. The effects are the same as for Alternatives 1 and 1a.

Forest Road 21—Overlook Toward Polk Inlet (Photopoint 12)

The VQO for this Timber Production LUD is Maximum Modification.

Alternatives 1 and 1a—The view from this point is a long-distance, panorama toward the head of Polk Inlet. Between the viewer position and the view terminus, most of the landscape is heavily altered (V). On clear days, the view terminus is a snow-capped, alpine peak on the east side of Polk Inlet. The EVC of the seen area on the east side of the inlet is untouched (I). A portion of the background is slightly altered (III).

The heavily altered nature of the landscape is due primarily to a number of harvest units from the late 1980's and early 1990's. From this photopoint, all distance zones show evidence of alteration. This viewshed already exceeds Maximum Modification VQO.

Alternatives F2, 4, F5—Four units are proposed for this viewshed under these alternatives. Two, 620-253 and 295, would contribute little to the cumulative visual effects as they are almost totally screened by topography and vegetation. Units 620-285 and 291, both higher on the slopes facing the viewer, would be visible but are about 6 miles from the viewpoint. Unit 285 is rectangular and does not borrow from the characteristic landscape. Unit 291 is 111 acres, which exceeds the typical size of 50 to 75 acres for an area of Maximum Modification with low VAC, but the unit is split into two halves with a wide buffered stream course in between.

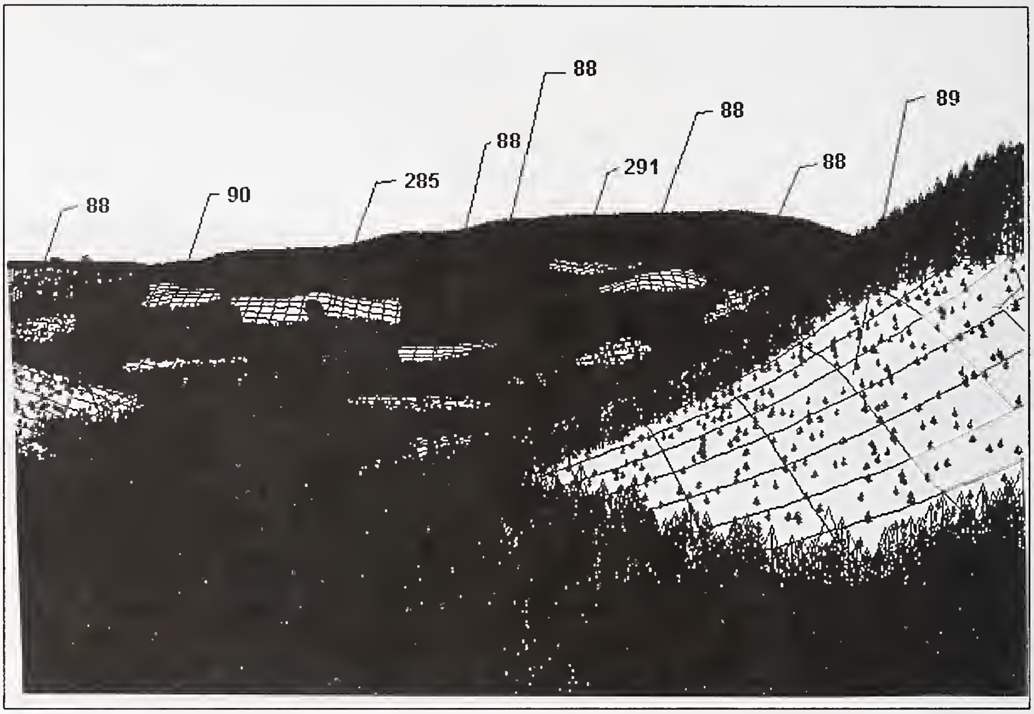
Figure 4-46 is a computer model of the viewshed with the previous cuts labeled by year. The proposed units which are visible are included. The CVD is approximately 37 percent of the seen area, which is within the proposed Forest Plan Revision standards and guidelines of 50 percent for an area with a Maximum Modification VQO. However, with additional harvest units, this viewshed would exceed the VQO of Maximum Modification, even though the cumulative visual disturbance percentages are within the guidelines suggested in the proposed TLMP revisions. The FVC would range from heavily (V) to drastically (VI) altered. In another decade, when the second growth attains some height, the EVC might be upgraded to V.

Alternative 3—Only Unit 620-253 is included in this alternative. It would not contribute to the Cumulative Visual Disturbance (CVD) from this photopoint.

Figure 4-46
Photopoint 12, Overlook Toward Polk Inlet, Alternatives F2, 4, F5

Polk Inlet Viewshed

The Polk Inlet Viewshed is subdivided by topography into component parts. The only subviewsheds included in the photopoint analysis are those with proposed harvest activities. The two subviewsheds are at the head of the Inlet and Goose Bay, which is the only Visual Priority Use Area in the entire viewshed. Figure 4-47 shows the location of the photopoints, their view orientation, the distance zone and potential and recently harvested units.



Head of Polk Inlet (Photopoint 13)

Two viewing locations are considered. One is on the road, near the proposed campground. The other is from the water, looking toward the head of the inlet. The entire area surrounding the head of Polk Inlet is designated for Timber Production. The area is mapped as not seen. Consequently, the draft VQO is Maximum Modification.

The entire area surrounding the head of Polk Inlet is designated for Timber Production. The area is mapped as not seen. Consequently, the VQO is Maximum Modification.

Alternatives 1 and 1a—The EVC's for this area range from untouched (I) on the eastern end of the inlet, to slightly altered (III), to moderately altered (IV), to heavily altered (V) moving clockwise around the end of the inlet, ending on the west side. From the road around the inlet, foreground vegetation screens and encloses views. The most evident alterations are a rock quarry, road cuts and fills, and some tree thinning along the roads. From the inlet, previous harvest on the southwest end of the inlet resulted in the EVC of heavily altered (V).

Figure 4-47
Polk Inlet Viewshed

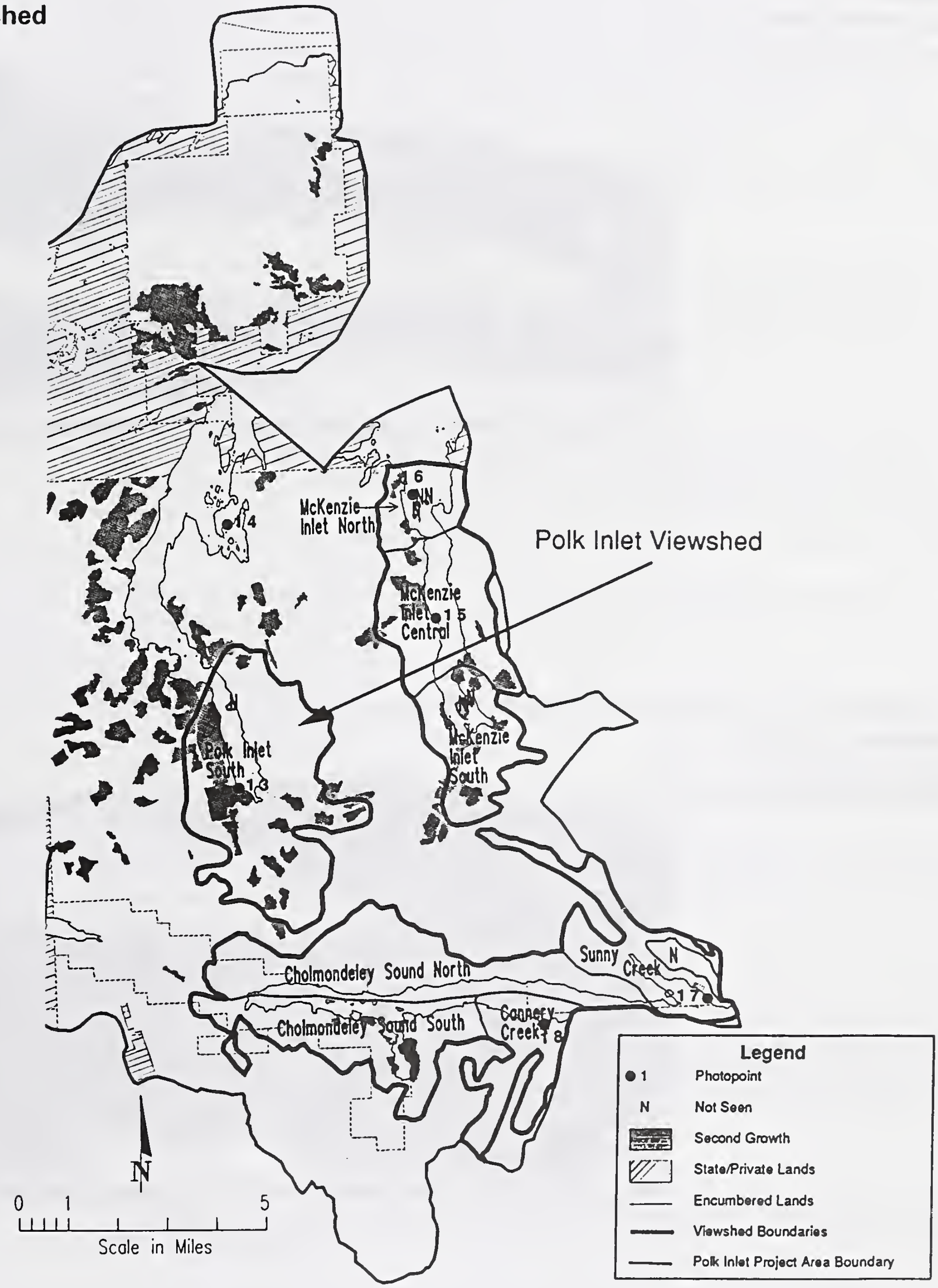


Figure 4-48
Photopoint 13, from Head of Polk Inlet, Alternatives F2, 4, F5

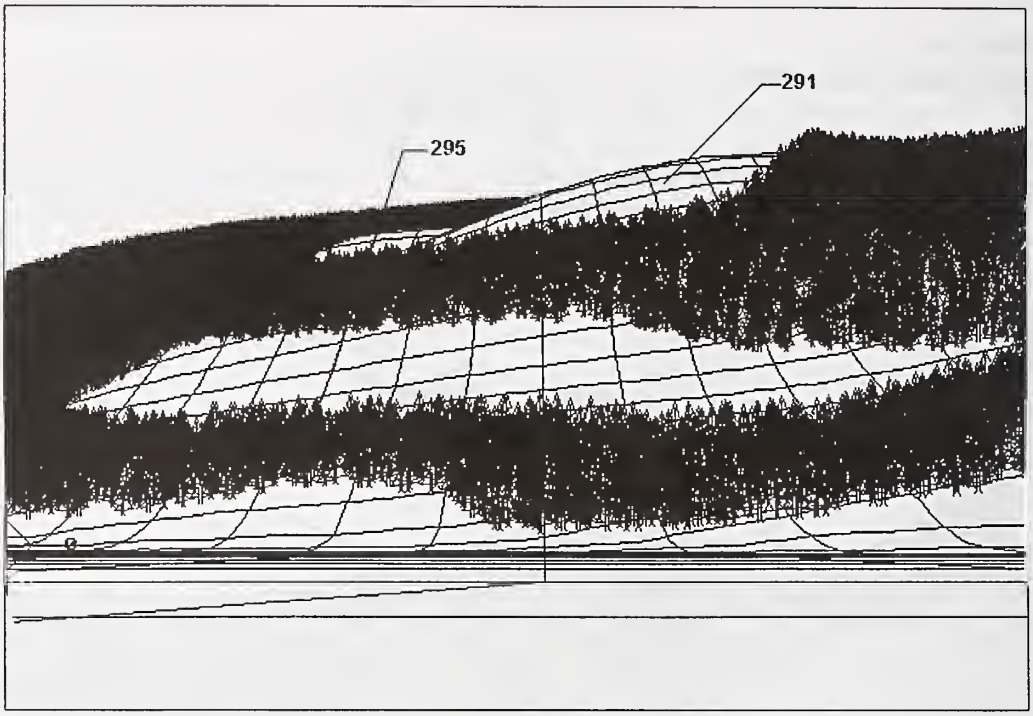
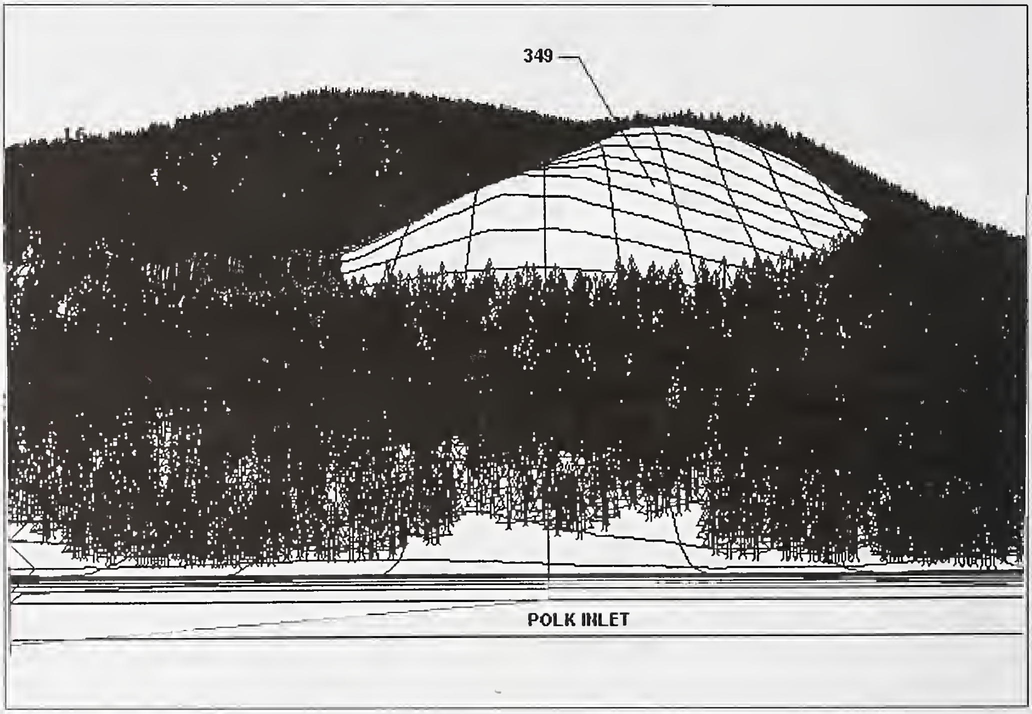


Figure 4-49
Photopoint 13, from Head of Polk Inlet, Alternatives F2, 4, F5



Alternatives F2 and F5—Seven units encircling the end of the inlet have potential visual effects. On the east, 620-285, 291, 295 and 349 are four large units with individual and cumulative effects. Unit 285 is rectangular and would not resemble a natural occurrence from any distance zone. Unit 291 (Figure 4-48) is high on the slope and visible from a greater distance and from multiple viewpoints. Part of the unit would bare the knoll of a hill which is part of the horizon line. Unit 295 (Figure 4-48) is on a flatter slope and most visible at its top boundary. Unit 349 (Figure 4-49) would remove trees from a ridge and knob which creates part of the horizon from the photopoint. It exceeds the typical unit size recommended in standards and guidelines for areas of low visual absorption capability. Units 285 and 291 also contribute to the CVD seen from Photopoint 12.

The FVC would become heavily altered (V) around the head of the inlet. The combined effect of the units, though significant visually, does not exceed the allowable CVD of 50 percent. When the CVD of the entire Polk Inlet Viewshed, from its mouth to its head, is considered, the additional harvest and roads push the level of alteration to the limits of Maximum Modification.

Units 620-307 and 325 at the south end of the inlet would have less visual impact from the viewpoint on the water, than for travelers on the road who would see them in the foreground. From the inlet, Unit 307 would not be seen. The top, elongated shape of 325 would be visible above the foreground vegetation. Unit 325 is included in Alternative F2, but not in Alternative F5. These units would meet the Maximum Modification VQO from the inlet viewpoint.

Unit 620-316, southwest of the inlet, is farther from the viewer and partially screened by topography. It would meet the Maximum Modification VQO.

Goose Bay (Photopoint 14)

The VQO for the Timber Production area is Modification for foreground and Maximum Modification for middleground.

Alternatives 1 and 1a—The EVC is untouched (I) in this viewshed. Under these alternatives, the EVC would not change and the VQO's would be met.

Alternatives F2, 3, 4, F5—No harvest is included in the action alternatives. The VQO's for this recreational anchorage will be met.

McKenzie Inlet Viewshed

Almost all the interior part of the inlet is considered Sensitivity Level 3 and is mapped as not seen. A linear portion of the northwest slopes near the mouth of the inlet are mapped as being in the middleground to viewers approaching the private land at Saltery Cove, a Sensitivity Level 1 area. Figure 4-50 shows the locations of the two photopoints used in the analysis and their viewing orientation.

Mid McKenzie Inlet (Photopoint 15)

The VQO for this Timber Production area is Maximum Modification as the interior part of the inlet is mapped as not seen.

Alternative 1—The EVC's are predominantly untouched (I), with an area of moderate alteration (IV) on the east side of the inlet, just south of the photopoint. The area of moderate alteration includes second growth from the late 1950's as well as cuts slated for 1993. Because of harvest in the 1989 to 1994 period, the FVC will be moderately (IV) to heavily (V) altered.

Figure 4-50
McKenzie Inlet Viewshed

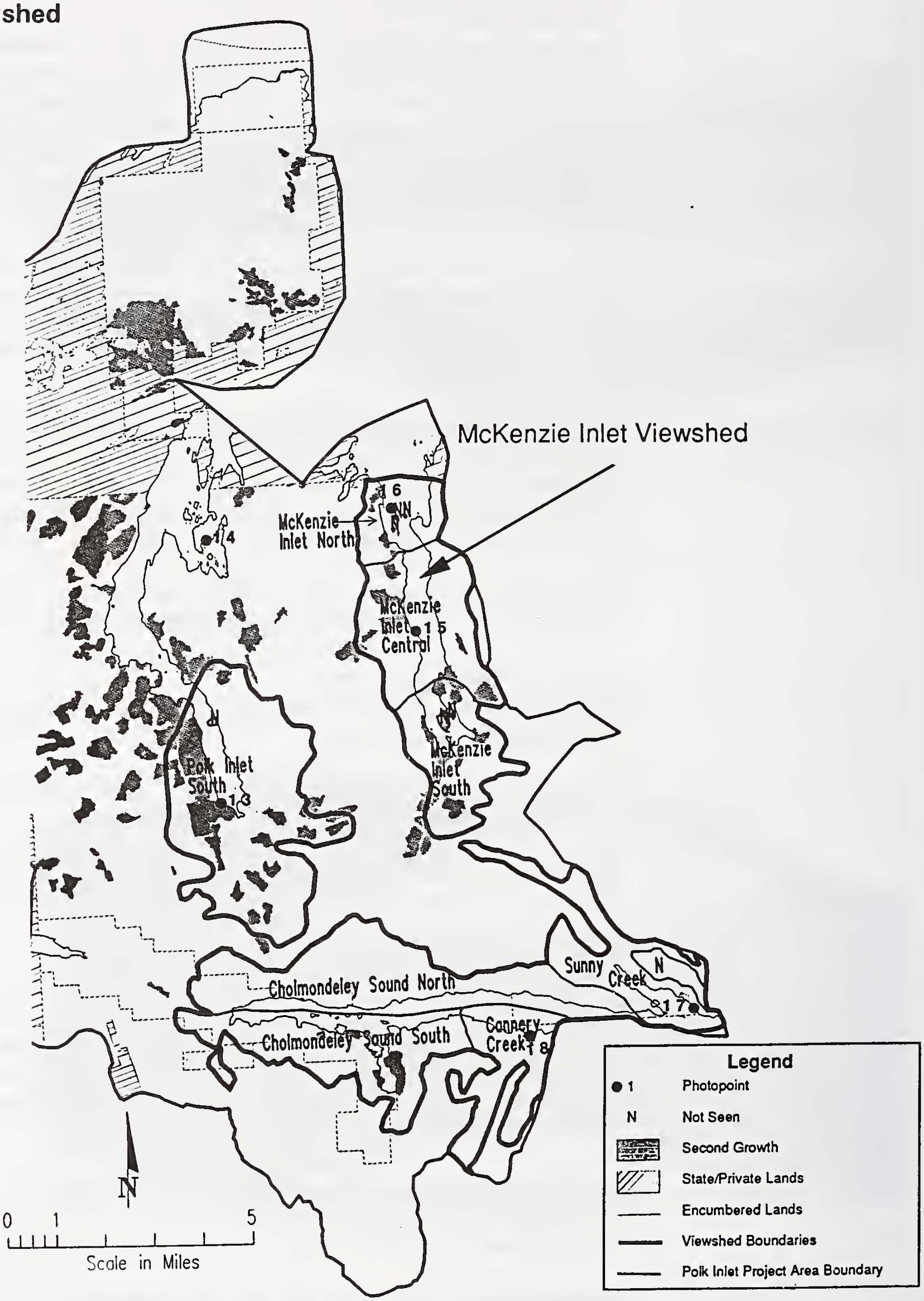
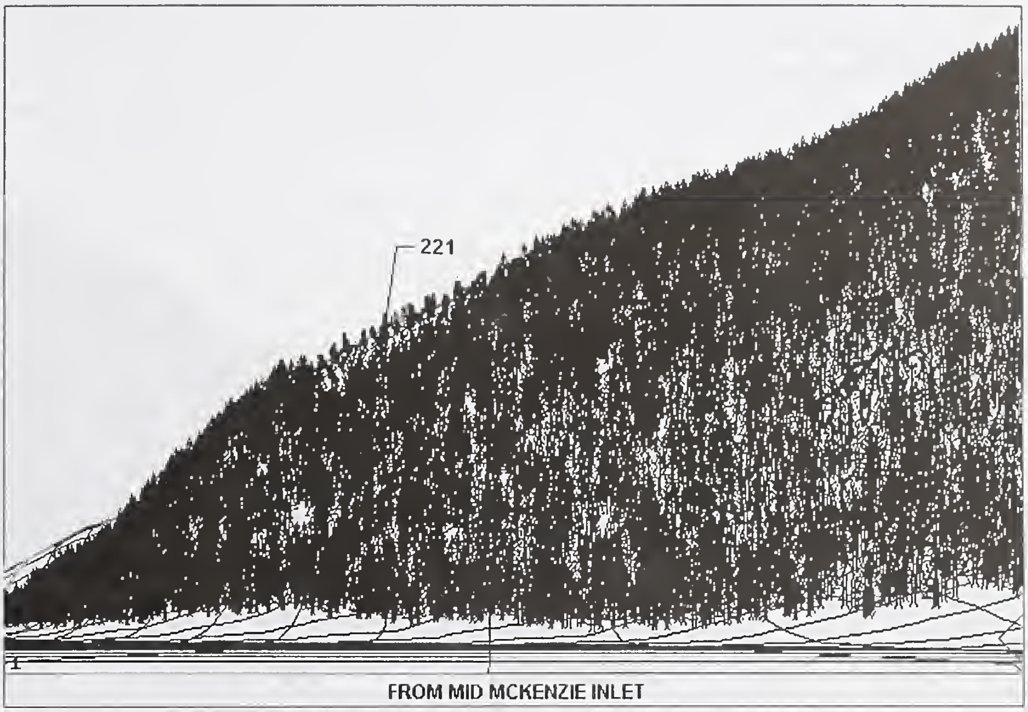


Figure 4-51
Photopoint 15, Mid McKenzie Inlet, Alternative 4



Alternative 1a—The harvest units scheduled to be cut in 1993 would be deferred.

Alternatives F2, 3, and F5—None of the proposed units are included in these alternatives. The comments from Alternatives 1 and 1a apply.

Alternative 4—Under this alternative two units on the west side of the inlet, 618-233 and 235, would be harvested. Unit 233 (Figure 4-51) is designed for a steep slope with low VAC. The unit shape does not appear to be a natural opening. It is in the foreground to a viewer from the inlet; however, the inlet is mapped as Not Seen. Foreground vegetation will screen the lower portion of the unit making it appear slightly smaller.

Unit 235 is at an oblique angle to the viewer from this photopoint and would not be very evident. Its visual effect would be greater from a different viewer position. The VQO of Maximum Modification will be met.

Mouth of McKenzie Inlet (Photopoint 16)

The VQO for this Timber Production area is Maximum Modification for both the middleground and not seen areas.

Alternatives 1 and 1a—The EVC's are predominantly untouched (I), with a narrow strip of slightly altered (III) along the west side of the mouth of the inlet. Two small cuts from the late 1980's have resulted in the altered condition. No harvest is planned in the immediate area prior to this proposal. The EVC would not change under these alternatives and the VQO's would be met.

Alternatives F2, 3, and F5—None of the proposed units are included in these alternatives. The comments from Alternatives 1 and 1a apply.

Figure 4-52
Photopoint 15, Mid McKenzie Inlet

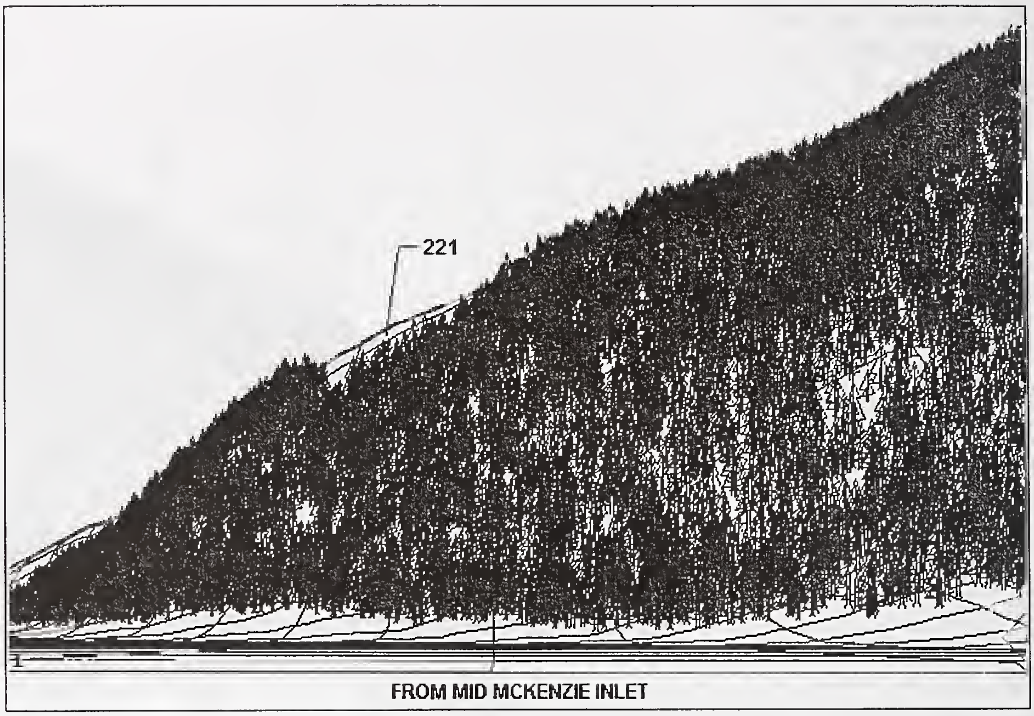
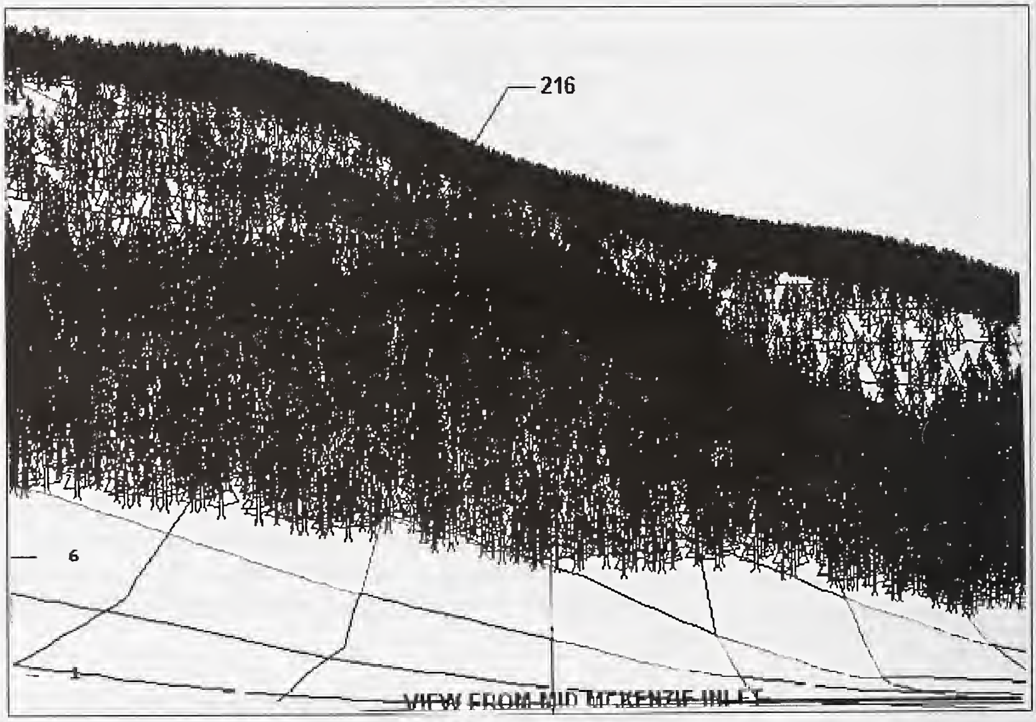
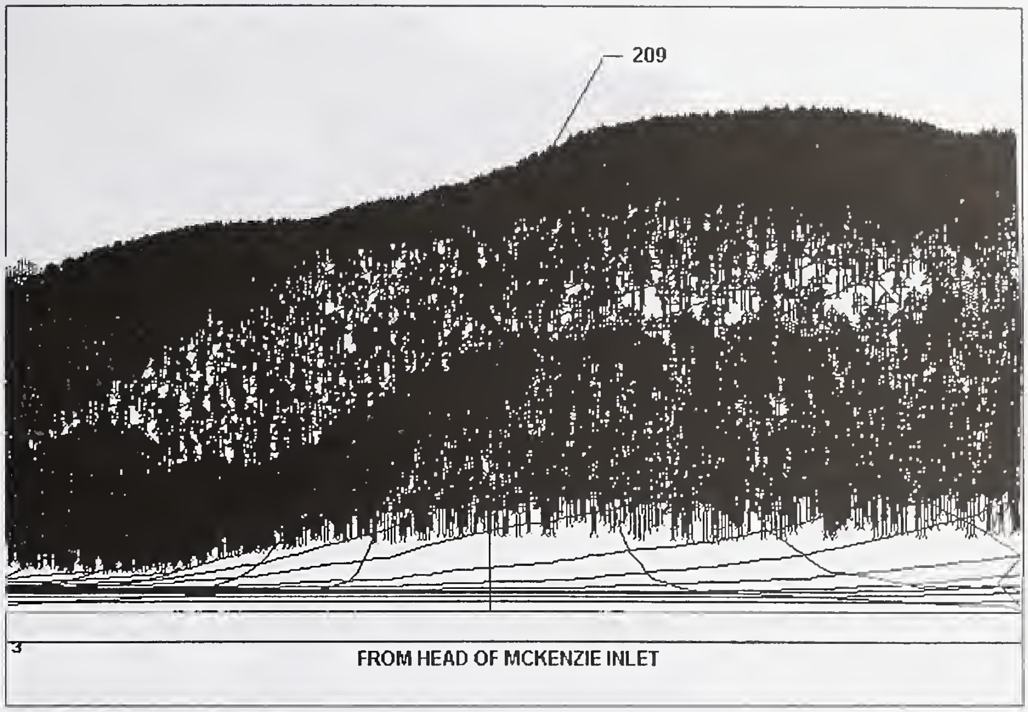


Figure 4-53
Photopoint 15, Mid McKenzie Inlet



Alternative 4—One unit, 618-209 (Figure 4-54), is included in this alternative. It is a 68-acre linear unit with angular boundaries at the west entrance to the inlet. It would be a helicopter- yarded, partial cut which would largely mitigate the visual effects. The FVC would be slightly (III) to moderately altered (IV) for this somewhat enclosed view at the mouth of the inlet. The VQO would be met.

Figure 4-54
Photopoint 16, from Mouth of McKenzie Inlet, Alternative 4



West Arm Cholmondeley Sound Viewshed

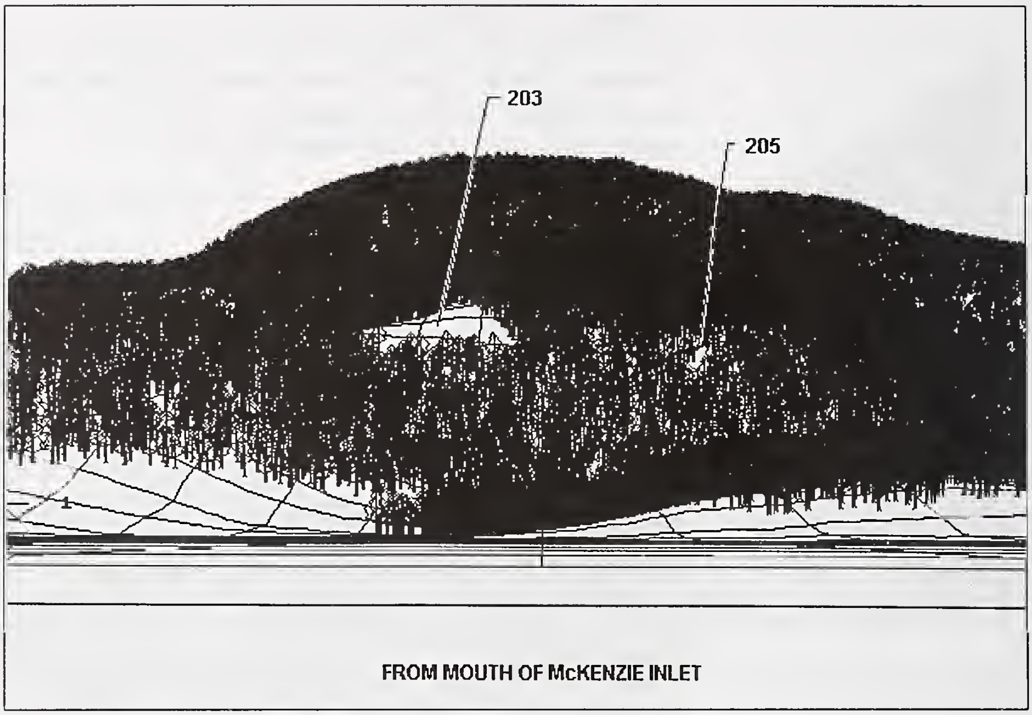
The viewshed of the West Arm is a LUD III under the current Forest Plan and Modified Landscape under the draft revisions to the Forest Plan. Numerous viewpoints were documented during field work. Two of the viewpoints, in the only areas where harvest is proposed under these alternatives, are used in the photopoint analysis. Scenic areas such as Big Creek and Sulzer Portage will not be affected by actions resulting from this entry and consequently are not included in the analysis. Figure 4-56 shows the viewsheds and photopoints with their viewing orientation.

Sunny Cove (Photopoint 17)

The VQO for this foreground, Modified Landscape designation is Partial Retention. Most of the proposed units are located in an area mapped as not seen.

Alternatives 1 and 1a—The EVC is untouched (I). A parcel of private land is along the north shore of the cove and just below the proposed units. Under these alternatives, the VQO would be met easily.

Figure 4-55
Photopoint 16, from Mouth of McKenzie Inlet



Alternatives F2 and 4—Neither of the proposed units is included in these alternatives. The comments from Alternatives 1 and 1a apply. The FVC would be unchanged from the EVC.

Alternative 3—Both Units 675-208 and 209 would be harvested under this alternative. Neither would be visible from the photopoint. The foreground vegetation and topography would screen the harvest units. The VQO of Partial Retention for foreground (Unit 209) and Modification (Unit 208) would be met. The FVC would change to slightly altered (III) because of the visible portion of the logging road and the LTF.

Alternative F5—Unit 209 would be harvested under this alternative. It would not be visible from the photopoint and the VQO would be met. The FVC would change to slightly altered (III) due to the logging road and LTF.

Cholmondeley (Cannery) Creek (Photopoint 18)

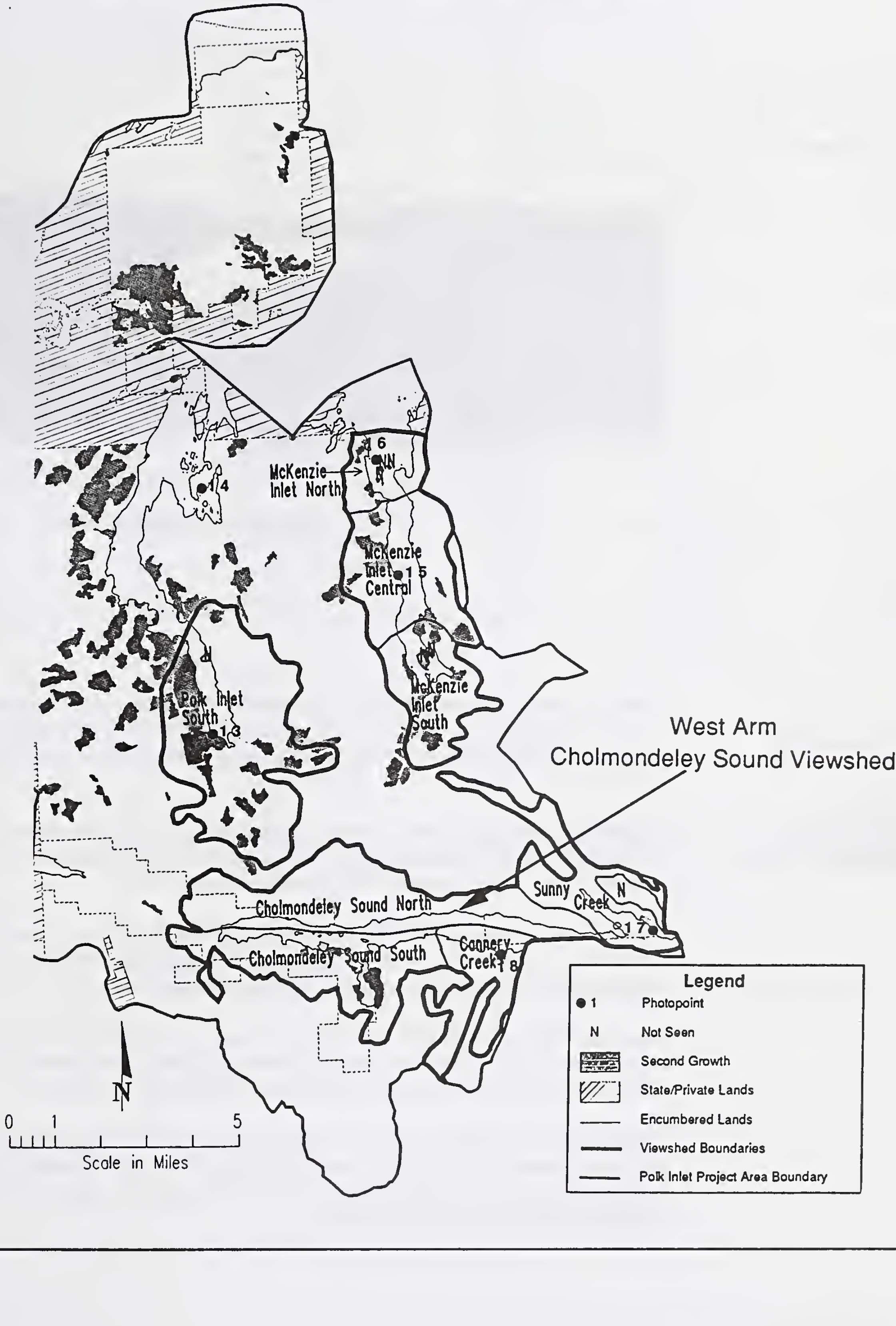
The VQO for the middleground, Modified Landscape designation is Modification. Foreground activities would need to meet a Partial Retention VQO.

Alternatives 1 and 1a—The EVC for the viewshed is untouched (I). Private land borders Cannery Creek at its lower reaches and extends both east and west around the cove at the creek outlet. Under these alternatives, the EVC would be unchanged and the Partial Retention VQO would be met.

Alternatives F2, 3, F5—None of the proposed units are included in these alternatives. Comments from Alternatives 1 and 1a would apply.

Alternative 4—Units 674-213, 253, and 265 are proposed for the Modified Landscape area of Cannery Creek, above the private land. From the saltwater photopoint, Units 213 and 253 would not be visible.

Figure 4-56
West Arm Cholmondeley Sound Viewshed



Unit 265 (Figure 4-57) climbs the slope to the ridge line in the middleground distance zone. The lower portion of the unit would be screened by topography and foreground vegetation, but the upper, angular edges would be visible and would result in a moderate scale contrast with the surrounding closed canopy. This unit would meet the Modification VQO. The FVC would be moderately altered (IV).

Figure 4-57
Photopoint 18, from Mouth of Cannery Creek, Alternative 4

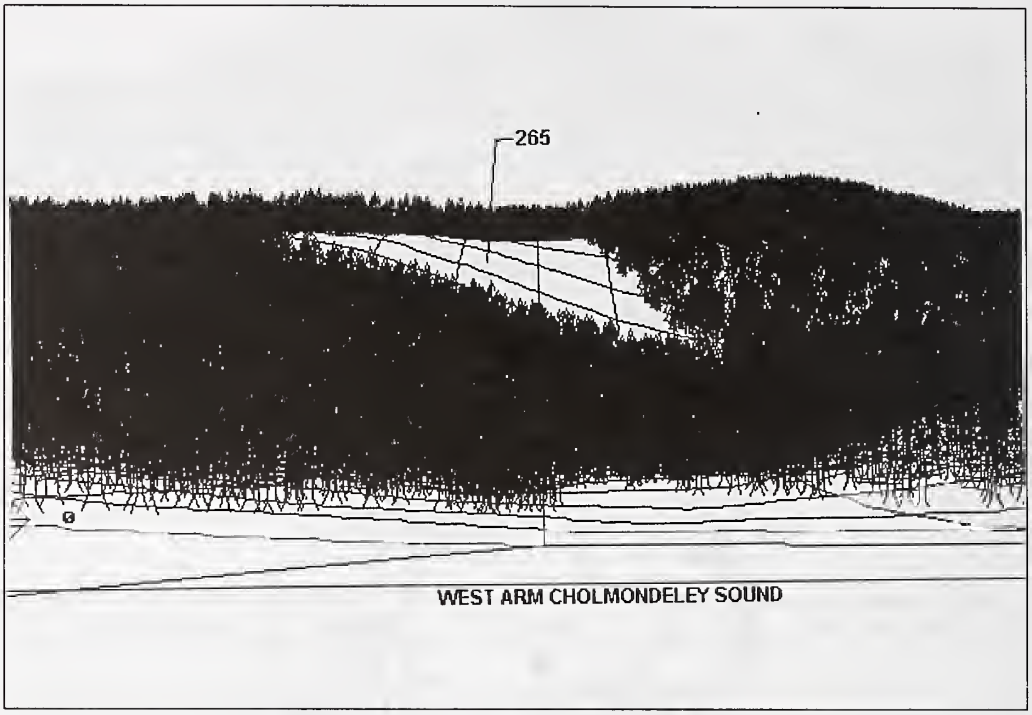


Table 4-90 summarizes the change in visual condition for areas viewed from the photopoints. Table 4-91 summarizes the acres of previous and proposed harvest by viewshed for the alternatives. See Appendix C for a complete table of photopoints and visual criteria.

Indirect and Cumulative Effects

Cumulative visual effects result from past management activities, plus proposed activities and those that will occur in the reasonably foreseeable future. The cumulative effects will be described for the major viewsheds identified in the Project Area.

A general quantification of cumulative effects is displayed in Tables 4-91 and 4-92. Table 4-91 shows the EVC and the FVC is after the proposed harvest period. Table 4-92 shows the acreage of previous and proposed harvest by viewshed and alternative.

Cumulative effects include the harvest units plus the additive effects of roads within and to units, landings, LTF's, and the contrasts caused by slash and second growth. This includes the effects of harvest activities on adjacent non-National Forest System lands.

Other, nontimber-related activities can contribute to cumulative effects. This may include increased community development in the Hollis area and at Harris Junction. More small-scale development may occur on private land within the Project Area, such as construction of additional houses in the Cannery Creek area.

Table 4-90

Change in EVC by Photopoint

Photo-point	Location	LUD	EVC	FVC
1	Ferry Route near Hollis	III[1/]/SV & TM[2/]	Type I & III	Type IV
2	Ferry Terminal	III/SV & TM	Type I	Type IV
3	Hollis Area	III & IV/SV & TM	Type I	Type IV
4	Mid Twelvemile Arm	IV/TM	Type I & III	Type III-IV
5	Head of Twelvemile Arm	IV/ML	Type I & III	Type IV
6	Hollis-Klawock Highway Overlook	IV/Ml, TM, LV	Type I & IV	Type IV
7	Harris Junction	IV/TM	Type I & IV	Type IV
8	One Duck Lake and Trailhead	IV/SV & TM	Type I & IV	Type IV
9	Hydaburg Road	IV/TM	Type IV[3/] & V	Type V
10	Forest Road 21	IV/TM	Type IV & V	Type V
11	Pass Lake - Forest Road 21	IV/TM	Type V	Type V
12	Overlook toward Polk Inlet - Forest Road 21	IV/TM	Type I & V	Type V
13	Head of Polk Inlet	IV/TM	Type I, III, IV, & V	Type V-VI
14	Goose Bay	IV/TM	Type I	Type V
15	Mid McKenzie Inlet	IV/TM	Type I & IV	Type V
16	Mouth of McKenzie Inlet	IV/TM	Type I	Type III-IV
17	Sunny Cove	III/ML	Type I	Type III
18	Cannery Creek	III/ML	Type I	Type IV

SOURCE: McGown 1993.

KEY:

Land Use Designation

III = Multiple Use [1/]
IV = Commodity Values [1/]
ML = Modified Landscape[2/]
TP = Timber Production[2/]
SV = Scenic Viewshed[2/]

Existing Visual Condition (EVC)

Type I = Untouched
Type II = Natural Appearing
Type III = Slightly Altered
Type IV = Moderately Altered
Type V = Heavily Altered
Type VI = Unacceptably Altered

Adopted Visual Quality Objective (VQO)

R = Retention
PR = Partial Retention
M = Modification
MM = Maximum Modification

* Deferred due to Cumulative Visual Disturbance.
1/ TLMP 1979a, as amended.
2/ TLMP Draft Revision 1991a.

Table 4-91

Acreage of Previous and Proposed Harvest in Seen Areas by Viewshed and Alternative

Viewshed	Acres Seen Area	Acres Second Growth	Acres by Alternative 1a	1	F2	3	4	F5
Twelvemile Arm	26,395	1,837	-56	0	334	1,103	628	290
Hollis Area	14,336	600	0	0	0	289	0	0
Central	7,975	696	0	0	306	783	597	262
South	4,084	541	-56	0	28	31	31	28
Hollis-Klawock Highway Corridor	7,156	1,239	0	0	67	74	7	67
Harris River	6,606	1,114	0	0	0	0	0	0
Harris Junction	1,550	125	0	0	67	74	7	67
Hydaburg Road Corridor	7,150	1,053	-124	0	305	309	96	305
North	3,804	560	-77	0	138	138	76	138
South	3,346	493	-47	0	167	171	20	167
Forest Road 21	3,221	1,741	-211	0	46	46	46	46
Polk Inlet South	7,340	1,310	0	0	486	0	432	486
McKenzie Inlet	7,772	812	-518	0	0	0	123	0
North	1,460	62	-8	0	0	0	69	0
Central	3,715	373	-278	0	0	0	54	0
South	2,597	356	-232	0	0	0	0	0
Cholmondeley Sound	15,143	202	0	0	0	40	133	0
North	5,383	3	0	0	0	0	0	0
South	4,753	199	0	0	0	0	0	0
Sunny Cove	2,735	0	0	0	0	40	0	0
Cannery Creek	2,272	0	0	0	0	0	133	0

SOURCE: McGown 1993.

Roading associated with timber harvest will provide more roaded recreation opportunities. This will likely attract more recreationists to areas previously accessible only by water or air. An influx of recreationists may require revision of sensitivity levels, distance zones, and Visual Priority Routes and Use Areas.

Transfer of lands to Native corporations and for state land disposal may result in management activities adjacent to National Forest Service system lands that would contribute to cumulative visual effects. This is true in West Arm Cholmondeley Sound which currently is an untouched (I) EVC. While somewhat speculative at this time, these activities may occur in the reasonably foreseeable future and could result in changes in the FVC of some areas.

Over time, the visual character of the Project Area will continue to change from one of old-growth forests contrasting with young second growth to different ages of second growth, creating a mosaic forest pattern. Forest visitors not associated with harvest activities likely will be able to distinguish timber production areas from specially designated areas where harvest does not occur, based on the different appearance of the forest cover.

Cumulative visual effects are described for the seven major viewsheds in the Project Area.

Twelvemile Arm (Photopoints 1, 2, 3, 4, 5, 6)

Alternative 3 would have the greatest cumulative impact due to the number of units harvested in this landscape level viewshed. Many of the proposed units in Twelvemile Arm are visible from more than one critical viewpoint, or photopoint. For example, the cumulative impacts of some of the units at the northeast end of the inlet could be said to have greater cumulative impact because they can be seen from the Hollis area, from the overlook on the Hollis-Klawock Highway, and from the inlet. At the head of the inlet, some of the units would be visible from the proposed cabin and campground, the road along the inlet, and from the water.

Roads to and between units add to the cumulative visual disturbance. A road would run through most of the units on the west side of the inlet. The road will be especially visible where it turns from the west side of the unit to cross the divide into the Indian Creek drainage.

Cut and fill slopes for roads and landings would cause contrast due to exposed soil. Roads would be visible in the units at the southeastern end of the inlet as well. The roads to the units in the Scenic Viewshed would be mostly unseen except for Units 211 and 201.

The Scenic Viewshed on the southeast shore of Twelvemile Arm across from Hollis is adjacent to Native corporation lands which have been altered by extensive clearcuts. The contrast between the Untouched (I) Scenic Viewshed and the large scale clearcut is dramatic. Alteration in the Scenic Viewshed would be small scale in comparison, but would add to the cumulative visual contrasts in this area.

The existing LTF at the end of the road along the southeastern shore of Twelvemile Arm would continue in use. No additional LTF's are planned for this viewshed.

Proposed recreational developments of a cabin and family campground near the head of the inlet will result in small scale visual effects. The developments will provide opportunities for visual enhancement as well.

In sum, the visual condition will shift substantially in the Twelvemile Arm viewshed from the unaltered to the altered end of the spectrum. With the exception of the southeast end of the viewshed which is EVC V, the rest of the viewshed is EVC I and III. The FVC under all alternatives will shift to levels IV and V.

Hollis-Klawock Highway (Photopoints 6 and 7)

Harvest was mostly deferred in this travel corridor until some future entry because of the existing level of cumulative visual disturbance due to past harvest. An extensive area along the Harris River to the south and on the north between Hollis and Harris Peak was cut in the early 1960's. As the second growth attains more height in the next several decades, the apparent level of alteration will decrease and the landscape will be able to absorb future harvest activities.

Other development may occur in the foreseeable future if state lands selected for disposal in the Hollis area and at Harris Junction actually are transferred to private ownership. Some of the land at Harris Junction (Photopoint 5) is slated for community and recreation development.

The visual condition of the corridor is predominantly heavily altered (V), although portions of the corridor could be upgraded to moderately altered (IV) where the second growth has attained the height and color and texture to minimize the extent of alteration. The visual condition within the corridor will not change under this entry with the exception of the proposed units southwest of the intersection of the Hollis-Klawock Highway and Hydaburg Road. There, one of the units is located in an area with EVC I.

The other exception is from the highway overlook toward Twelvemile Arm. This overlook is like a window into the neighboring viewshed. Currently the view is of an area predominately with EVC I. The FVC will range from III to IV for the area viewed from this overlook.

Hydaburg Road (Photopoints 8 and 9)

Much of the view corridor along the Hydaburg Road has been altered by previous harvest, most of it in the late 1980's. Two proposed units along the road were deferred because of cumulative visual disturbance.

All the alternatives would have approximately the same cumulative effect on the road corridor with Alternative 4 having slightly fewer units potentially visible from the road corridor.

Other visual disturbances are because of rock quarries adjacent to the road.

The EVC along the Hydaburg Road ranges from I to V, with the greatest proportion in IV and V. The FVC will remain about the same, with some shift to more IV and V under certain alternatives. Two units visible from the road in areas of substantial alteration were deferred. Other units above the road, in less visible positions, will still be harvested, resulting in some shift to more IV and V FVC.

Forest Road 21 (Photopoints 10, 11, and 12)

This road corridor can be divided into two segments for analysis. From the Hydaburg Road to Twelvemile Arm, it is a Visual Priority Route. Much of the earlier harvest along this segment occurred in the mid to late 1960's. The second growth is tall enough to begin enclosing views to the foreground road corridor. Alternative 1a would result in reduced cumulative impacts if the proposed 1993 harvest units are deferred.

The segment of road from Twelvemile Arm to Polk Inlet is not a designated Visual Priority Route. Much of the previous harvest occurred in the late 1980's. Consequently the corridor appears to be substantially altered along much of its length. Areas of recent harvest do not as easily absorb additional harvest activities.

From Photopoint 12, the cumulative visual disturbance in the viewshed is about 37 percent including the proposed units. Proposed Revised Forest Plan standards and guidelines permit up to 50 percent CVD. To a viewer from this point, the impression is of a greatly altered landscape which will not absorb further harvest at this time.

From the Hydaburg Road to Twelvemile Arm, the EVC ranges from moderately altered (IV) to drastically altered (VI). None of the alternatives in this entry would add to the level of alteration.

Beyond Twelvemile Arm to the end of the well-maintained road on the east side of Polk Inlet, the EVC ranges from untouched (I) to heavily altered (V), with the greatest proportion in the latter category. With the proposed harvest activity from this entry and up to 1995, further alteration will occur to eliminate the untouched category and increase the level of alteration in other categories. The viewshed from Photopoint 12 will reach the drastically altered (VI) condition under Alternatives F2, 4 and F5.

Polk Inlet (Photopoints 13 and 14)

The northern end of Polk Inlet has been extensively altered from the characteristic landscape. Native corporation lands from the vicinity of Goose Bay to Skowl Arm have been extensively clearcut. A sharp dividing line is apparent between the private and Forest Service land.

The National Forest System land within Polk Inlet has also been substantially altered by recent harvest activities, most in the late 1980's, and early 1990's, from the private land to the middle of the inlet near the floating logging camp.

The logging camp and smaller Forest Service development add to the cumulative visual effects. The LTF, seaplane base, floating village, and log rafts introduce temporary contrasts in form, line, color, and texture. From this area to the head of the inlet, there has been less alteration and a portion of the head of the inlet retains the high scenic quality of the natural landscape. At present, most of the alteration has occurred on the southwest end of the inlet. In implementing all of the alternatives except 3, substantial harvest will occur on the southeast end of the inlet as well.

A proposed family campground at the southeast end of the inlet is sited somewhat inland and likely would not be visible from the saltwater viewpoint. From the road two units will be visible in the foreground, adding to the existing alterations from a rock quarry and bridge.

The EVC ranges from I to V at the head of the Inlet. The FVC would range from III to V under Alternatives F2, 4 and F5, with most of the area being in conditions IV and V. Conditions would not change from the EVC of I and IV in Goose Bay as there would be no additional alteration from this entry.

McKenzie Inlet (Photopoints 15 and 16)

At present McKenzie Inlet is scenically intact. Several small units were harvested on the west side of the mouth in the late 1960's. They are not apparent. Toward the head of the inlet, several units harvested in the late 1950's largely blend with the old-growth forest.

A number of units are planned for the head and west side of McKenzie Inlet in the 1989 to 1994 operating period. These, plus the proposed harvest units will combine to substantially alter the visual character of the inlet. If Alternative 1a is implemented, the cumulative impacts will be less, as the 1993 units will be deferred.

Roads have a great potential for visual impact in this inlet because the slopes are so steep that extensive cuts and fills will be required. In addition, an LTF will be built toward the southeast end of the inlet, introducing contrast primarily in line and color.

The EVC is predominantly untouched (I), with pockets of slightly (III) and moderately (IV) altered. The FVC at the completion of this entry would largely be heavily altered (V).

Cholmondeley Sound (Photopoints 17 and 18)

Substantial clearcutting has occurred on Native corporation lands at the entrance of Cholmondeley Sound. Once past the South Arm, the sound is scenically intact. The only small scale alterations are from cabins on private lands at Sunny Cove and Cannery Creek.

Proposed harvest in this entry would add minimal cumulative impacts. The units at Sunny Cove would not be visible from the saltwater viewpoint. The greatest visual impact would be from the LTF. One of the units at Cannery Creek would be visible as would an LTF. A number of building lots are available in the private land surrounding the outlet of Cannery Creek. It is possible a number of houses could be built here. The existing houses are screened by foreground vegetation and are barely visible. The remains of an historic cannery provide the greatest evidence of past human use of the area.

The rest of the West Arm would not be affected by this entry. In the foreseeable future, land along lower Big Creek, Sulzer Portage and the western third of the West Arm is likely to be conveyed to Native corporations and likely would be logged. If the area is logged to the extent of the slopes around Dora Bay, then the FVC would change to V or VI, creating substantial cumulative visual disturbance.

The EVC in the West Arm is untouched (I), with the exception of the area surrounding the Big Creek estuary which is moderately altered (IV). The FVC would change in two local areas as harvest was deferred in this entry for the majority of the West Arm. In Sunny Cove, the FVC would become III and at Cannery Creek the FVC would become moderately altered (IV) under Alternative 4.

Mitigation

The most effective mitigation occurs before harvest begins. The approach to the allocation and design of units early in the study process had the effect of mitigating potential visual effects in several key viewsheds. The decisions, from most general to most specific, dealt with allocation of units based on issues, unit size by LUD, selection of individual units from the unit pool, boundary modifications to individual units, harvest method, and silvicultural system. During the process, all resources were considered concurrently. The results specific to the visual resource are presented here.

The first decision phase of unit selection resulted in deferral of some units from consideration even before field work began. The Harris River drainage, for example, exhibits significant alteration from previous harvest activities. Based largely on concerns about cumulative visual impacts, the potential units in the drainage were eliminated from consideration in this entry. Four other viewsheds, representing landscape scale geographic areas, were not considered for entry at this time for visual and other resource reasons. Those areas were at the mouth of Twelvemile Arm north of the Hollis Ferry Terminal; at the southwest end of Twelvemile Arm; in Cholmondeley Sound on the north shore; and on the south shore, west of Cannery Creek. The second decision phase was based on examination of unit size according to the land use designation and distance zone of the unit location. Units in a more restrictive LUD, such as Scenic Viewshed, were examined for proposed size and compared to the typical unit size stated in the standards and guidelines (Mitigation Measure V1).

The third decision phase was the actual allocation of units to the alternatives from the remaining pool. The units not selected for specific alternatives often raised concerns about visual quality issues. Two units along Hydaburg Road were deferred specifically because of cumulative visual impact concerns identified after fieldwork.

The fourth decision phase occurred in the field and in the office. These decisions focused on boundary modifications or unit design (Mitigation Measure V1). Unit design, because it affects introduced form, line, color, and texture, is an important mitigation technique for the visual resource at this level of planning. Field modification of units occurred in conjunction with information about drainages, cliffs and outcrops, soils, wildlife, and other resources that were discovered by field crews. Unit design, because it affects introduced form, line, color and texture, is one of the most important on the ground mitigation techniques. The VMS directs that management activities are to borrow from the characteristic landscape to create natural appearing alterations. It is difficult to emulate natural forest openings on the forested slopes of the Tongass National Forest because they are not common. Natural openings on slopes generally are caused by landslides and blowdown and seldom have straight edges and geometric shapes. The shapes and sizes of units are two design criteria that can mitigate visual impacts.

The last two decision phases were at the prescription level. Harvest method and silvicultural systems are mitigation techniques that occur at the implementation stage and depend on the people who perform and monitor the logging operations (Mitigation Measures V2, V3, and V4). The harvest method can affect visual impacts as each method has built-in opportunities and constraints. The harvest method will affect the location and amount of roading, the unit shape, and leave islands, for example. The harvest method with the greatest potential to mitigate visual effects is select cut helicopter logging. Because roads are eliminated, helicopter yarding minimizes ground disturbance, and helicopter yarding offers flexibility in silvicultural systems, and contrasts in form, line, color, and texture are minimized. The selected silvicultural system is an important element in reducing the magnitude and duration of visual impact. Partial cuts (Mitigation Measure V2), for example, are the least visually obvious. Because most units would be clearcut, other techniques are necessary for visual mitigation. Shelterwood harvest in cedar stands provides opportunities to plan where the leave trees will be to mitigate visual effects.

In clearcuts, as well as select cuts, leaving nonmerchantable timber, snags, and brush will minimize contrasts of line, color, and texture, including those caused by slash (Mitigation Measure V3). Leaving merchantable reserve trees along harvest unit and setting edges will serve to reduce visual contrast with adjacent areas (Mitigation Measure V4).

Buffer strips of vegetation along roads, streams, and on ridge lines, along with leaving an island of vegetation for wildlife, are designed to lessen the visual impact of harvest. In cutting units, making uneven boundaries will reduce the contrast at the edges (Mitigation Measure V3). The ragged margins will be created by punching yarding lines into the unit boundaries and leaving blocks of nonmerchantable and low-volume timber and other vegetation between the ends of the yarding lines at the unit margins (see *Vegetation and Timber Resources* in Chapter 4).

Buffers strips of vegetation along roads, streams, and ridge lines, along with creating islands of vegetation for wildlife and screening, are effective methods for mitigating some of the contrasts. Seeding road cuts and fills will reduce the duration of impact by revegetating those areas which can cause the greatest contrast in color.

Slash management, especially in foreground and near middleground units along Visual Priority Routes and Use Areas, will help reduce the contrast in color and will reduce the duration of visual impact. This may include slash removal, cutting stumps close to the ground, cutting slash into smaller pieces or burning or coloring slash to reduce the color contrast.

Because of the topography, location of units, and other factors, some site-specific mitigation measures will further reduce the visual impacts of timber harvest and related activities. The site-specific measures are tabulated by harvest unit in Appendix B and described in detail in the unit cards. They are summarized by photopoint below.

Ferry Route Near Hollis (Photopoint 1)

The topography within Unit 611-201 presents opportunities for visual and watershed mitigation. A stream bisects the unit just below the proposed logging road into the unit. Leaving a buffer of vegetation along the drainage and partial cutting the top part of the unit above the road (Mitigation Measure V2) would result in screening of the road and muting of the visual effects of the most visible part of the unit in the Scenic Viewshed. The bottom portion of the unit would be clearcut, but would be only partially visible because of screening of foreground vegetation.

Creating ragged borders on the other two most visible units, 611-204 and 612-211, and leaving nonmerchantable timber in the clearcuts (Mitigation Measure V3), would reduce some of the contrast with the surrounding landscape. Maintaining trees on the ridge line in Unit 612-211 would prevent a notch in the horizon line.

Ferry Terminal (Photopoint 2)

From this viewpoint Unit 611-204 is more visible than from the ferry route. The hard, rectangular shape would be modified by creating ragged unit margins as described above (Mitigation Measure V4).

Hollis Area (Photopoint 3)

Select cut helicopter yarding is prescribed for four units which will not be roaded. Select cutting will mitigate the visual effects of harvesting these units (621-293, 307, 308, 310).

Mid Twelvemile Arm (Photopoint 4)

During field work, some of these unit boundaries were modified to mitigate visual and other resource concerns (Mitigation Measure V1). The road through the units on the west slope of the inlet would create a contrast in line, color, and texture. Revegetating road cuts and fills would help reduce these contrasts. Siting landings near unit boundaries would screen the potentially large cut and fill slopes needed to create a level landing area. Leaving unmerchantable trees and other vegetation in clearcuts (Mitigation Measure V3) would reduce the duration of impact as the vegetation that is left reduces contrast with exposed soil and leaves in place plant materials which would speed the time to revegetation.

Units 621-251 and 252 are crossed by streams. The streams would be split or suspension yarded, potentially leaving some streamside vegetation to provide visual diversity and reduce the stark contrast of the clearcut.

Unit 621-259 on the east side of the inlet also is crossed by streams which would be left with a vegetative buffer. Leave islands (Mitigation Measure W1) were recommended for wildlife. If leave islands are found to be a viable technique, they would help mitigate visual effects as well. Unit 621-262 also is intersected by two drainages which would require full suspension and split yarding. Leaving vegetation, perhaps in an island where the streams intersect, would screen part of the road and create visual diversity within the unit.

Unit 621-264 is a slightly irregularly shaped unit not deeply penetrated by roads. It is on a steep slope. Leave as much unmerchantable timber standing as possible (Mitigation Measure V2). Directional falling in a 100 to 150 foot band around the edges of the unit will create ragged margins (Mitigation Measure V3). Screening the landing at the top of the unit will reduce contrasts in line, color, and texture.

Head of Twelvemile Arm (Photopoint 5)

There are opportunities for view enhancement in this viewshed. When the recreational development occurs, consideration should be given to opening views to the estuary and directing views to parts of the viewshed with the highest scenic quality (Mitigation Measure V5). Maintaining roadside vegetation to screen views, and creating openings in the vegetation to frame views, would help direct viewers' attention away from the potentially visible harvest units.

Hollis-Klawock Highway Overlook (Photopoint 6)

Five of the six potentially visible units are scheduled to be partial cuts harvested by helicopter (Mitigation Measure V2), thus largely mitigating the visual effects. Unit 621-291 would be clearcut, leaving behind all nonmerchantable timber (Mitigation Measure V3).

Harris Junction (Photopoint 7)

These units are planned for helicopter yarding and the retention of nonmerchantable trees and safe snags over the entire unit area (Mitigation Measure V2). This would reduce contrasts associated with cable yarding logging systems such as exposed soil and slash piles.

Hydaburg Road (Photopoint 9)

Unit 624-201 is adjacent to the road and could be visually screened by a buffer strip along the road. If a wind-safe buffer cannot be maintained, slash management, cutting stumps close to the ground, and cutting slash into smaller pieces, will be necessary.

Forest Road 21 (Photopoint 10)

Maintaining trees in strategic places along Forest Road 21 would provide sufficient screening that these units may not be visible.

Head of Polk Inlet (Photopoint 13)

Some opportunities for view enhancement exist within the road corridor where the campground would be sited (Mitigation Measure V5). Maintaining foreground vegetation along the road would screen views to the heavily altered slopes. Views could be opened to Rock Creek and the estuary. Reclamation of the rock quarry and treatment of slash in the units along the road would enhance the views in the vicinity of the proposed campground.

Mid McKenzie Inlet (Photopoint 15)

Units 618-216 and 221 would be harvested by helicopter in partial cuts (Mitigation Measure V2). The visual impacts would be substantially mitigated using these logging and silvicultural systems.

Units 618-233 and 235 are on steep slopes which bring the units into direct view of persons on the water of the inlet. Leaving behind nonmerchantable trees (Mitigation Measure V3) and ragged margins would help reduce the scale and duration of contrasts caused by timber harvest.

Mouth of McKenzie Inlet (Photopoint 16)

The visual effects of these potential units are largely mitigated by selection of helicopter yarding and partial cuts as the logging and silvicultural systems (Mitigation Measure V2).

Sunny Cove (Photopoint 17)

The only visible part of timber harvest would be the LTF. LTFs introduce line, color and texture contrasts which are greater at closer viewing distances and can be mitigated in the long-run by reclamation after harvest. Yarding and parking areas may be sited in clearings in the forest near the LTF, but out of view.

Cholmondeley (Cannery) Creek (Photopoint 18)

Maintaining foreground vegetation along the access road and below Unit 674-265 would help screen some harvest visual effects. Maintaining ridge line trees would prevent a large notch from being created in the horizon line. Leaving low volume timber and brush will reduce the contrasts associated with clearcutting. A LTF will be constructed in the cove. See the LTF discussion under Photopoint 17.

Monitoring

Several of the mitigation techniques, such as creating ragged edges and leaving dirty clearcuts, do not have a history of implementation on the Tongass National Forest. Periodic follow-up would document the effectiveness of the suggested mitigation measures for this forest type. At a minimum, viewsheds would be inspected by a landscape architect just prior to and after cutting to ensure that the VQO is met.

Photopoints used in the analysis provide established monitoring points which should be checked every five years. A photographic record of the revegetation of the harvest units would establish a set of measures which could be modified to be more effective or replicated elsewhere.

Forest uses and users should be monitored to determine if the sensitivity level, distance zone and Visual Priority Routes and Use Areas designations require updating.
Forest-wide visual resource monitoring is proposed in the TLMP Draft Revision (1991a). This field monitoring is designed to determine if completed management activities meet the VQO as adopted in the Forest Plan (Visual Resource Monitoring Item 1).

Project-specific monitoring has been identified to monitor the implementation and effectiveness of the four types of clearcutting with reserve trees that have been prescribed for Polk Inlet Project units as an ecosystem management measure. This monitoring will include the preparation of a brief report by wildlife and visual resource specialists, based on ground observations and comparisons with unit cards and silvicultural prescriptions.

Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas

Key Terms

Recreation Opportunity Spectrum (ROS)—a system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs.

Recreation place—an identified geographic area having one or more physical characteristics that are particularly attractive to people engaging in recreation activities; can contain from zero to several recreation sites.

Recreation site—specific location or site where recreational activities occur and/or a recreational facility is located. A recreation site is smaller in area than a recreation place.

Recreation Visitor Day (RVD)—a measure of recreation use of an area. One recreation visitor day consists of recreation use of a site or area by one person for 12 hours can be abbreviated "visitor day."

Roadless area—an area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Wild and Scenic River—rivers or sections of rivers designated by congressional action under the 1968 Wild and Scenic Rivers Act or by an act of the Legislature of the state or states through which they flow.

Wilderness—areas designated by congressional action under the 1964 Wilderness Act or by TTRA and/or ANILCA; undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation.

Introduction

Timber management activities can change recreation settings, and thus have an effect on the use of recreation sites, types of recreational activities available, and the quality of the recreational experience. Timber harvest activities generally affect the visual character of recreational settings and can open previously inaccessible, nonroaded areas to motor vehicles. The character of the landscape and the new accessibility usually results in changes in the Recreation Opportunity Spectrum (ROS) settings. Changing the appearance of an area and making it accessible to motor vehicles can result in changes to the type of experiences available in an area, and changes in the quality of the recreation experience. This section examines the effects the alternatives would have on recreation in the Project Area by examining the effects the alternatives would have on various components of recreation.

This section discusses how the alternatives potentially would affect recreation, roadless, wild and scenic river, and wilderness resources. It first examines how ROS settings would be affected by the alternatives and what effects changes would have on recreation in the Project Area. Then it examines the effects the alternatives would have on recreation places and sites, and goes on to discuss the potential effects of the alternatives on recreation activities and use patterns in each VCU. It next discusses effects on commercial outfitters and guides, and then discusses the effects that timber industry employees can have on recreation. Effects of the alternatives on road management, and recreation in each VCU are next discussed. The effects of the alternatives on Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas are examined, followed by a discussion of the cumulative effects of timber harvest on recreation in the Project Area region. Finally, mitigation measures are suggested.

ROS Settings

All of the alternatives would result in changes in the amount of nonroaded and roaded ROS settings found in the Project Area. Under Alternatives F2 through F5, there would be an increase in acreage of roaded ROS settings. As a result (depending upon the number of new and reconstructed roads left open for recreational use), there would be more opportunities for recreational activities that benefit from road accessibility. The increase in acreage of ROS settings theoretically available for roaded recreation would be accompanied by a decrease in acreage and a fragmentation of ROS settings that could theoretically support nonroaded recreation and whose participants would require, or prefer, attributes associated with nonroaded settings. The effects of each alternative on ROS settings is discussed below.

The primary change from the existing condition as a result of implementing any of the alternatives would be a reduction in the Semi-Primitive Non-Motorized (SPNM) ROS setting, and an increase of Roaded Modified (RM) (Figures 4-58a through 4-58f and Table 4-92). The change would result in smaller areas of SPNM and fewer total acres that could potentially support primitive and semi-primitive recreation. The alternative harvest activities would result in more area of RM that would be available to potentially support roaded recreation. The following discusses changes in the existing ROS settings that would occur as a result of implementing each alternative.

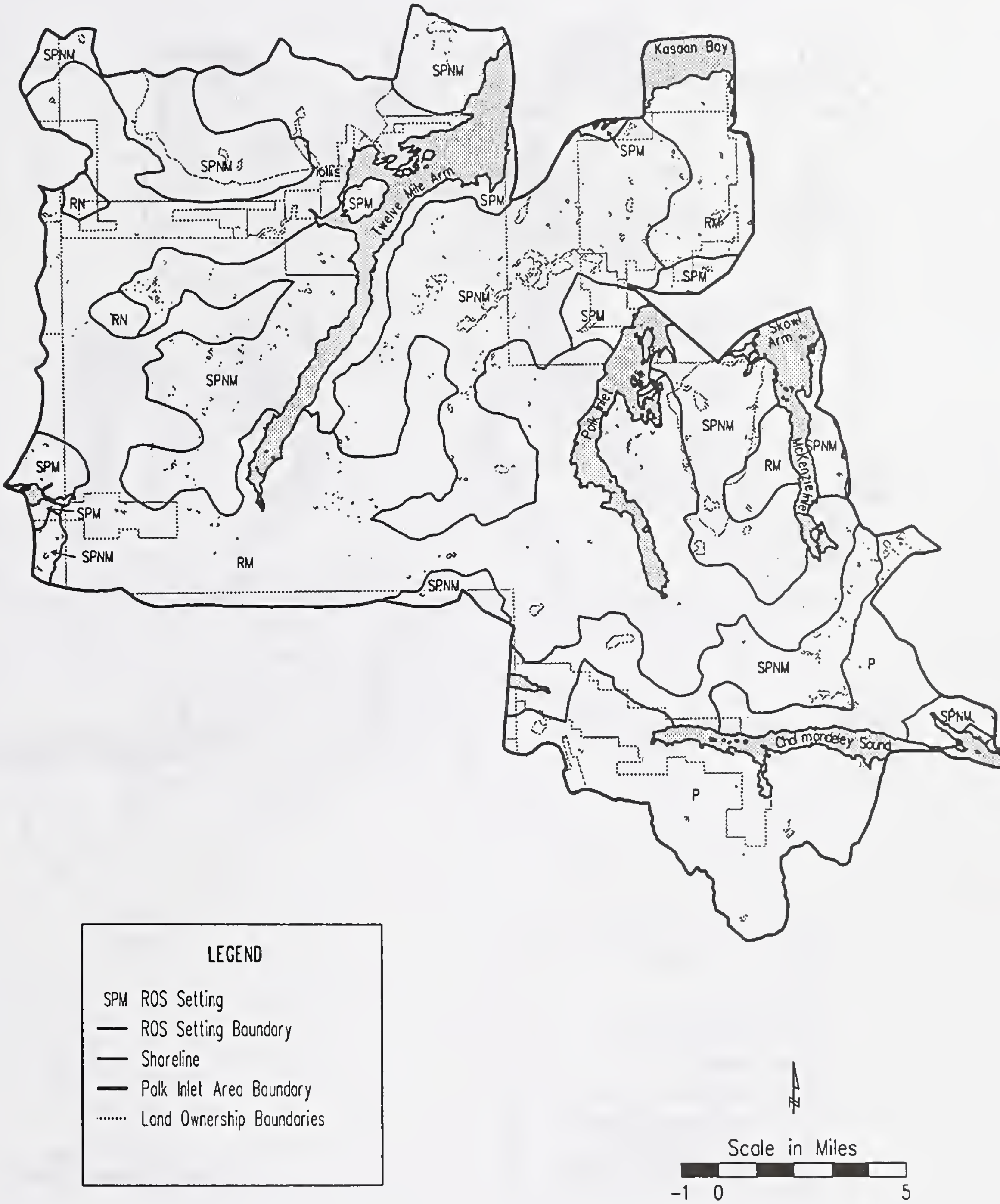
Alternative 1

Alternative 1, the no action or existing condition alternative, is used as the baseline for comparing the effects of the other alternatives on recreation. Existing conditions as described in Alternative 1, reflect what the recreation conditions would be if all of the timber harvesting scheduled in the 1989-94 EIS occurred. Chapter 3, *Recreation, Roadless Areas, Wild and Scenic Rivers, and Wilderness Areas*, discusses the ROS conditions existing with Alternative 1.

Alternative 1a

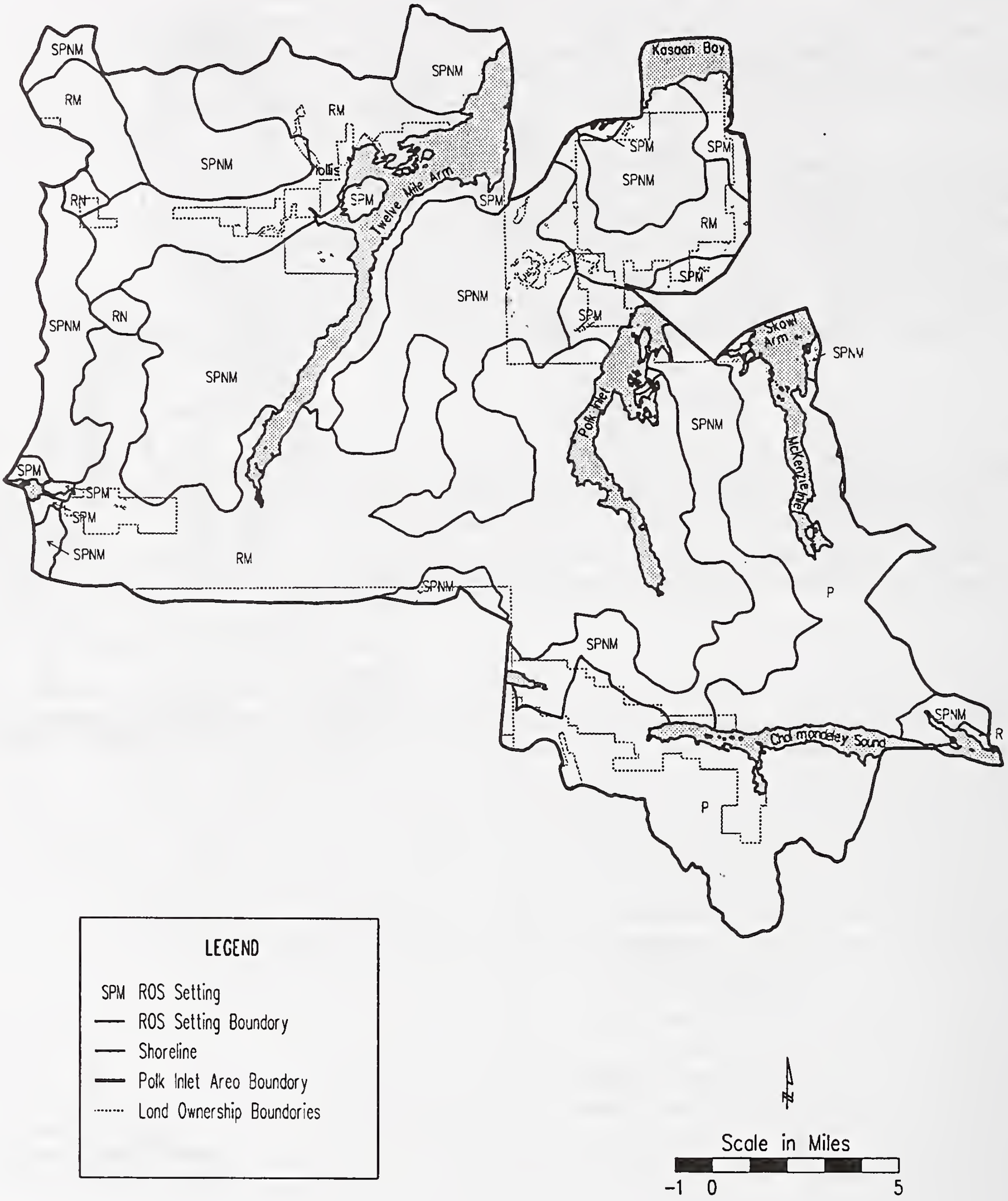
Alternative 1a proposes no timber harvest in the Polk Inlet Project Area effective with the date of the Polk Inlet ROD (early 1994). It would eliminate 52 of 95 harvest units scheduled for harvest under the 1989-94 EIS. In addition, it would eliminate 35 miles of new road, and the development of three LTF's—two at McKenzie Inlet, and one near Little Coal Bay. Harvest of the eliminated harvest units and construction of the LTF's could be deferred to sometime in the future. Alternative 1a would reduce the amount of timber harvest relative to Alternative 1 and would result in approximately 12,000 more acres with a ROS setting of P than would Alternative 1 (Table 4-92, Figure 4-58b). These 12,000 acres would be converted to RM in Alternative 1. As a result, Alternative 1a would provide more opportunities for recreational activities that require pristine or less-developed settings than Alternative 1; Alternative 1 would provide more opportunities for recreational activities that require roaded settings.

Figure 4-58a
Recreation Opportunity Spectrum (ROS) Settings—Alternative 1



SOURCE: Forest Service, Ketchikan Area, database.

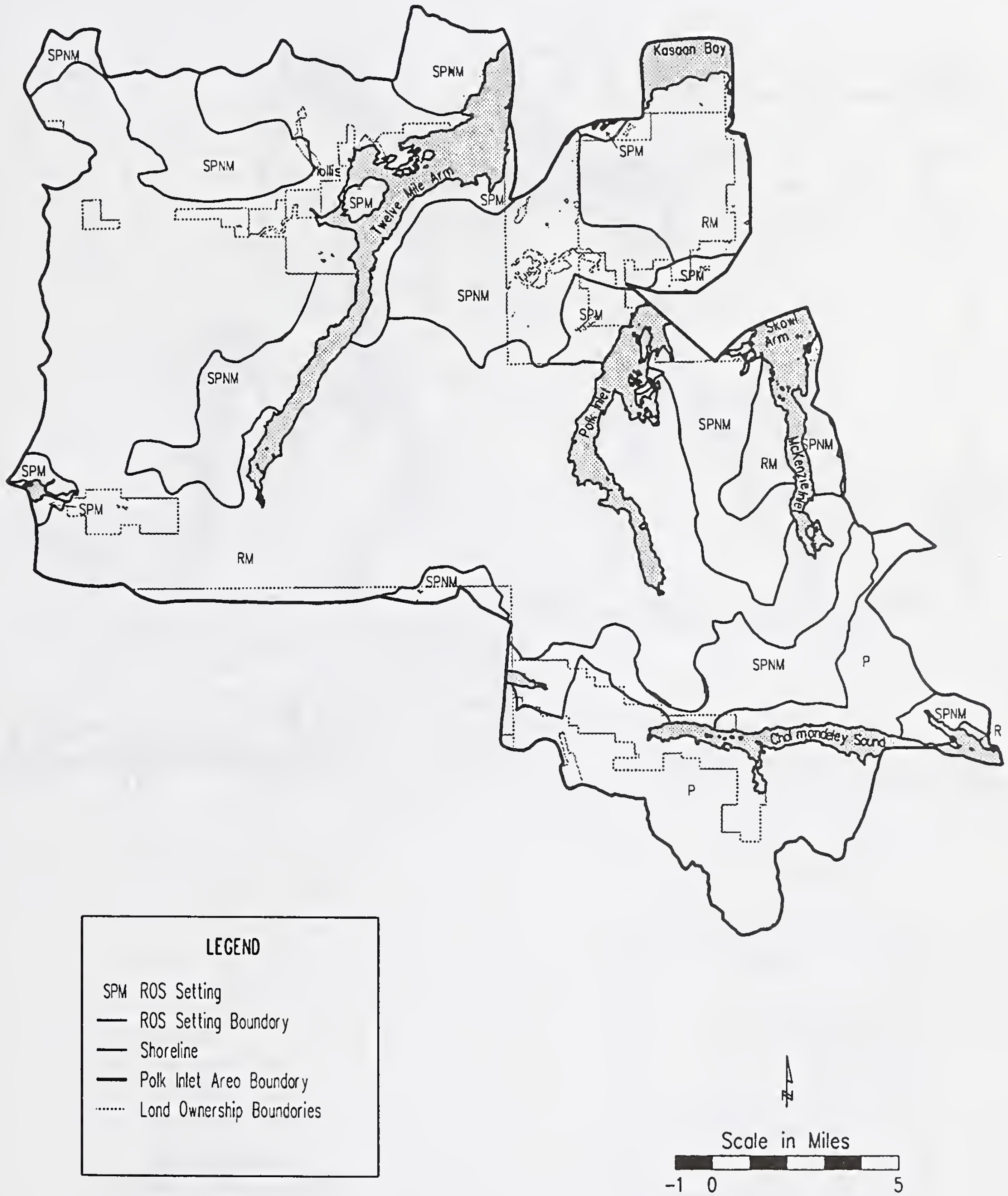
Figure 4-58b
Recreational Opportunity Spectrum (ROS) Settings—Alternative 1a



SOURCE: Forest Service, Ketchikan Area, database.

Figure 4-58c

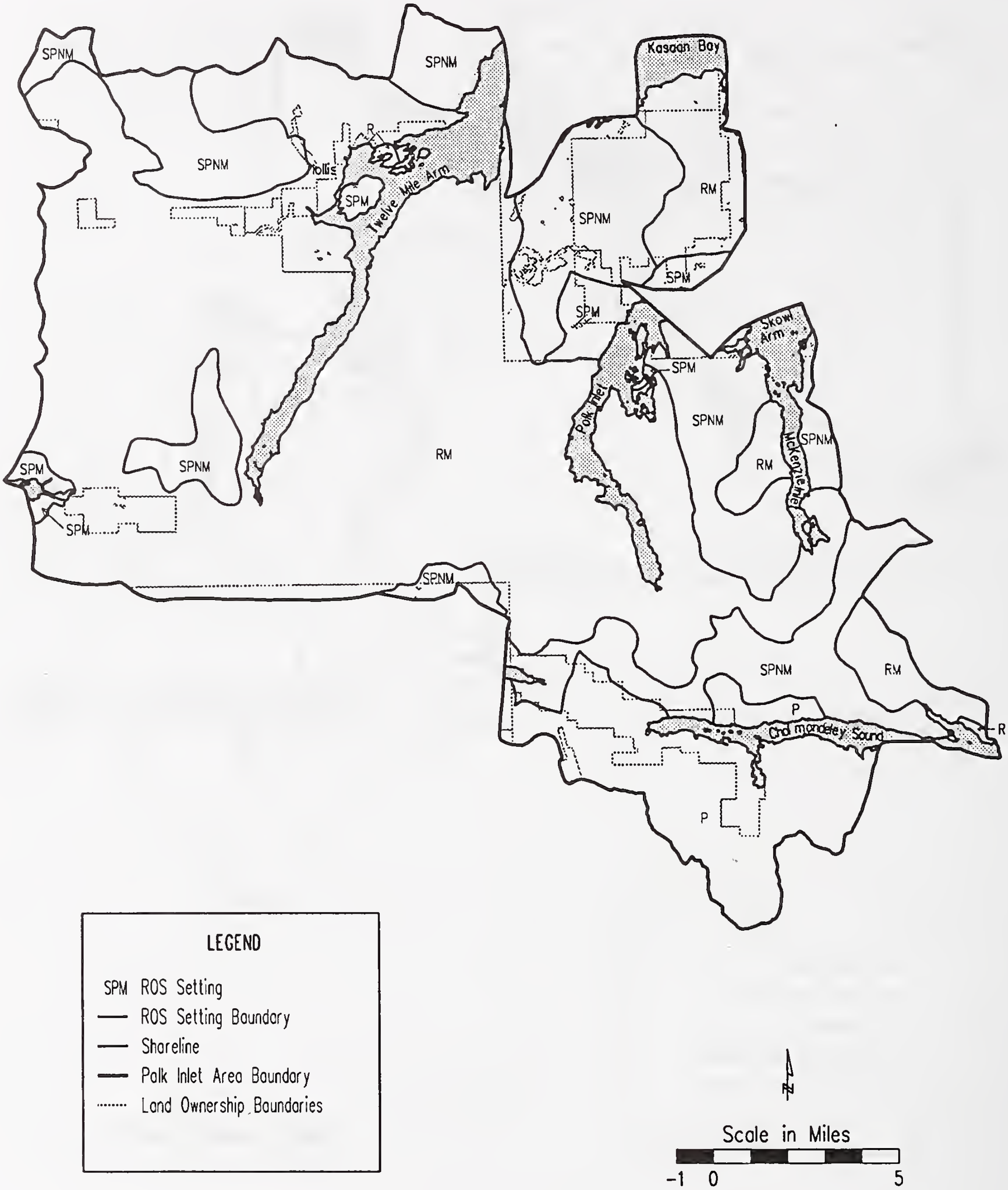
Recreational Opportunity Spectrum (ROS) Settings—Alternative F2



SOURCE: Forest Service, Ketchikan Area, database.

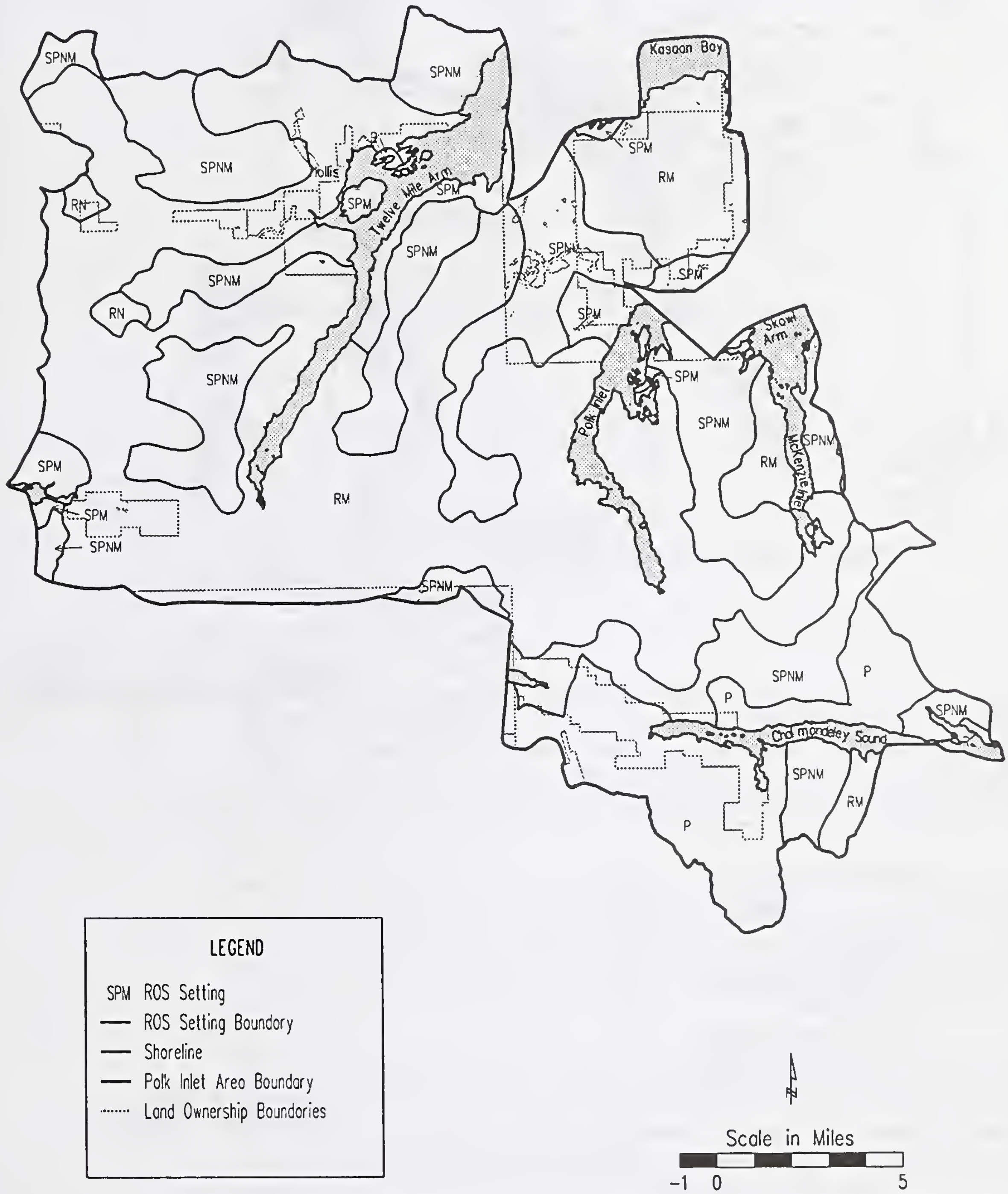
Figure 4-58d

Recreational Opportunity Spectrum (ROS) Settings—Alternative 3



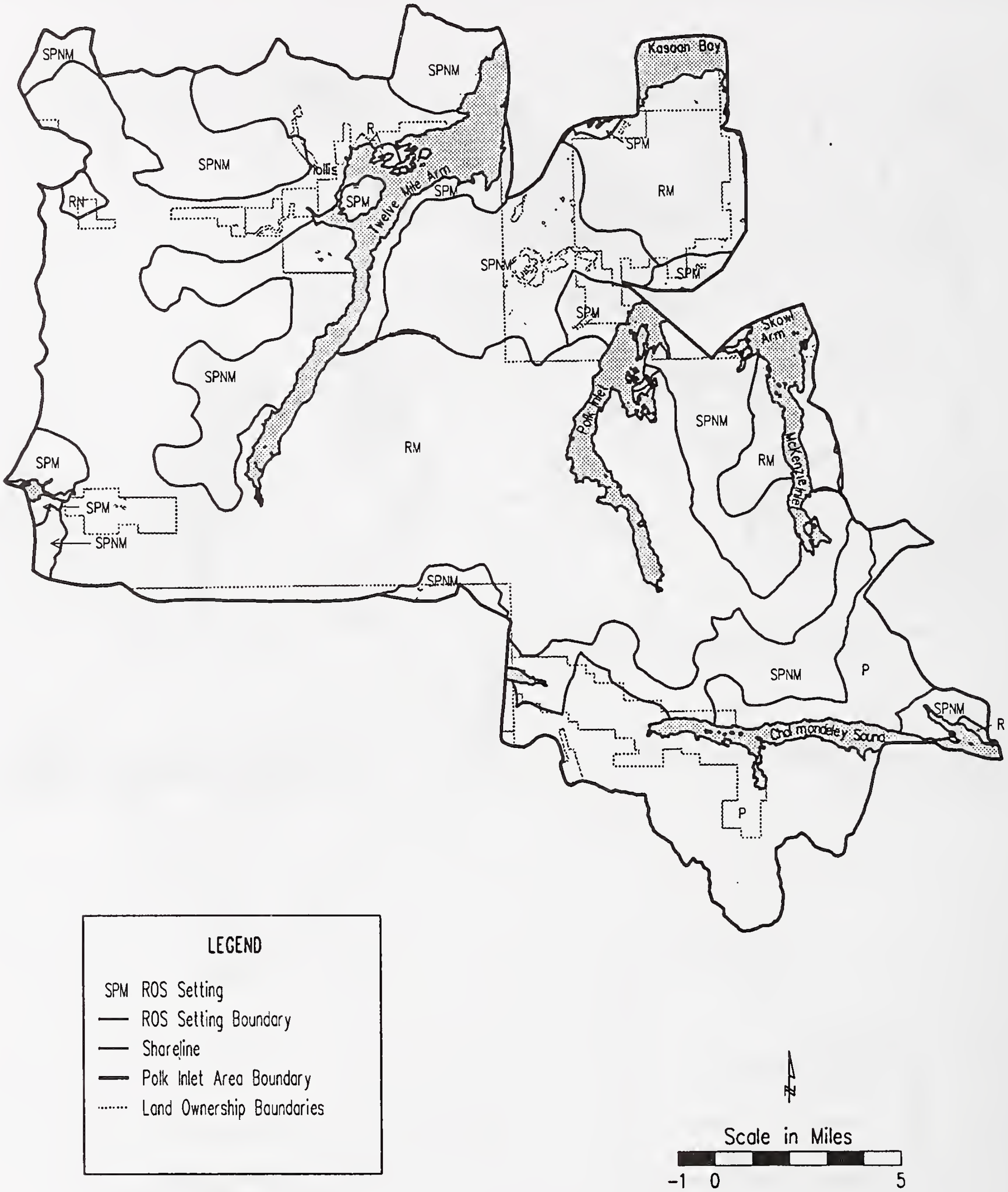
SOURCE: Forest Service, Ketchikan Area, database.

Figure 4-58e
Recreational Opportunity Spectrum (ROS) Settings—Alternative 4



SOURCE: Forest Service, Ketchikan Area, database.

Figure 4-58f
Recreational Opportunity Spectrum (ROS) Settings—Alternative F5



SOURCE: Forest Service, Ketchikan Area, database.

Table 4-92
ROS Settings by Alternative Based on Acreage and Percentage of Total

ROS Setting	Alt. 1	Alt. 1a	Alt. F2	Alt. 3	Alt. 4	Alt. F5
P	19,748	31,707	19,748	15,098	15,876	19,748
	(12)	(19)	(12)	(9)	(9)	(12)
SPNM	66,489	66,424	44,945	40,624	52,450	48,619
	(40)	(40)	(27)	(24)	(31)	(29)
SPM	3,717	4,010	2,538	364	2,821	2,894
	(2)	(2)	(2)	(>1)	(2)	(2)
R	142	142	142	142	142	142
	(>1)	(>1)	(>1)	(>1)	(>1)	(>1)
RN	897	879	—	—	752	23
	(>1)	(>1)	0	0	(>1)	(>1)
RM	75,848	63,661	99,460	110,595	94,782	95,397
	(45)	(38)	(60)	(66)	(58)	(57)
Total	166,823	166,823	166,823	166,823	166,823	166,823

SOURCE: Forest Service, Ketchikan Area, database.
1/ Percentages appear in parentheses.

The retention of areas with ROS settings of P, would affect recreation in several locations in the Project Area. If Alternative 1a were implemented rather than Alternative 1, the pristine setting of McKenzie Inlet, which is currently surrounded by ROS settings of SPNM and P, would be retained. As a result, recreationists participating in activities where they require or prefer a pristine or less-developed setting, would continue to be able to recreate at McKenzie Inlet until sometime in the future when the area would be entered for timber harvest.

Other sections in the Project Area that receive recreational use would also be subject to less harvest with Alternative 1a than with Alternative 1. By not harvesting in the western part of the Project Area (particularly in the vicinity of the One Duck Trail), less of the area would be converted to an ROS setting of RM. Instead, large areas currently classified as SPNM would be retained and recreational activities that occur in them would continue to take place.

Implementing Alternative 1a would not have a great effect on roaded recreational opportunities within the Project Area. None of the 35 miles of proposed roads to harvest units that would be eliminated under Alternative 1a would have provided new access to important recreation areas. The primary effects to recreation that would occur if Alternative 1a were implemented would be continued and potential use by recreationists that require, or prefer, pristine or near pristine areas in which to recreate, until a time in the future when the areas would be entered for timber harvest.

Alternative F2

The primary effect of Alternative F2 timber harvest activities on ROS settings would be the change in size of the two largest SPNM settings in the Project Area (Figure 4-58c). The larger of the two settings is the 28,200-acre setting located between Twelvemile Arm and Polk Inlet. Harvest activities and roads into the area would change much of its southern part to a setting of RM and reduce the total acreage of the SPNM setting to 14,600 acres.

The other large SPNM setting in the Project Area (14,600 acres) extends inland from the western shore of most of Twelvemile Arm. The setting includes the existing One Duck Trail, One Duck Shelter, and potential One Duck Trail extension. Alternative F2 would change most of the setting to RM and reduce the amount of SPNM to 4,900 acres (Table 4-92). The remaining area of SPNM would be confined to an area west of the south end of Twelvemile Arm. The section of SPNM setting containing the One Duck Trail, One Duck Shelter, and potential One Duck Trail extension contain helicopter units and would be converted to RM.

There would be no harvest activities in the McKenzie Inlet or Cholmondeley Sound areas, so ROS settings in those locations would not change.

Alternative 3

The effect of Alternative 3 on the two large SPNM settings found in the Project Area would be similar to Alternative F2. However, Alternative 3 would convert more of the SPNM area located between Twelvemile Arm and Polk Inlet to RM than Alternative F2 (Figure 4-58d and Table 4-92). The SPNM setting would be reduced from 28,200 acres to 11,200 acres. Alternative 3 would also introduce a road and harvest units into Sunny Cove, which would result in the conversion of approximately 800 acres of SPNM and 2,700 acres of Primitive (P) to RM.

Alternative 4

Alternative 4 would result in roads and harvest units being introduced into the SPNM setting located between Twelvemile Arm and Polk Inlet. As a result, the setting would be split into two smaller linear areas that would total 10,400 acres (Figure 4-58e). The large SPNM setting west of Twelvemile Arm would also be split by a road and harvest activities into two smaller areas, which would total 16,100 acres. One of the areas would include the area containing the existing One Duck Trail, One Duck Shelter, and potential One Duck Trail extension.

Four harvest units on the west side of McKenzie Inlet proposed in Alternative 4 would result in an enlargement of an existing RM setting and a reduction in size of a SPNM setting.

A new road and harvest activities near Cholmondeley Sound would convert approximately 1,500 acres of P to RM and convert an additional estimated 1,500 acres of P to SPNM.

Alternative F5

The primary effect from the implementation of Alternative F5 would be the reduction in size of the SPNM setting located between Twelvemile Inlet and Polk Inlet (Table 4-92). Alternative F5 would convert approximately 13,400 acres of the 28,200 acre SPNM setting to RM.

Some of the SPNM setting west of Twelvemile Arm would also be reclassified as RM (Figure 4-58f). Of the 15,500 existing acres of the SPNM setting, approximately 3,700 acres would be converted to a ROS setting of RM.

Other smaller ROS settings that would be converted to an RM setting include areas near McKenzie Inlet and the uplands above Coal Bay that are currently classified as SPNM or P.

Recreation Places and Sites

Because data on the number of recreationists who recreate in remote areas such as the Project Area is very limited, it is difficult to estimate how the alternatives would affect recreationists who use an area. Another way of evaluating the potential effects alternatives could have on recreation at specific locations is to examine how the alternatives would change ROS settings in which recreation places and sites are located.

The ROS setting in which a recreation place or site is located influences the type and quality of recreational experiences possible at the place or site. By examining the changes that would occur in the ROS settings as a result of implementing the alternatives, comparisons between the alternatives can be made. The comparisons can indicate differences in the types and quality of potential recreational experiences available in an area.

As illustrated in Table 4-93, there is not much difference between the alternatives in terms of ROS settings in which existing recreation sites are located. Although more recreation sites would be located in an ROS setting of RM under all of the action alternatives than under Alternative 1, the increases would not be great because most of the existing sites (15 of 20) in Alternative 1 are located in ROS settings of RM. Alternative 4 would result in the least change in the ROS of existing sites and would be the only action alternative to retain a site in an ROS setting of SPNM. Alternatives F2, 3, and F5 are identical in the ROS settings for existing recreation sites.

Table 4-93

ROS Settings of Existing Recreation Sites by Alternative

ROS Setting	Alt.1	Alt.1a	Alt. F2	Alt. 3	Alt. 4	Alt. F5
P	1	2	1	1	1	1
SPNM	1	2	—	—	1	
SPM	2	—	—	—	—	—
RN	1	1	—	—	1	—
R	—	—	—	—	—	—
RM	15	15	19	19	17	19
Total	20	20	20	20	20	20

SOURCE: Forest Service, Ketchikan Area, database.

Key:
- — = No existing
- P = Primitive
- SPNM = Semi-Primitive Non-Motorized
- SPM = Semi-Primitive Motorized
- RN = Roaded Natural
- R = Rural
- RM = Roaded Modified

The alternatives would have somewhat more of an effect on potential recreations sites than existing sites. As depicted in Table 4-94, 11 of 21 potential recreation sites in the Project Area are currently located in an ROS setting of RM. Eight of the remaining 10 potential sites are located in unroaded ROS settings. Alternatives F2, 3, and F5 would increase to 16 the number of potential sites located in RM; Alternative 4 would increase the number to 12 and would change the ROS settings of potential sites the least of all the action alternatives.

Table 4-94

ROS Setting of Potential Recreation Sites by Alternative

ROS Setting	Alt. 1	Alt. 1a	Alt. F2	Alt. 3	Alt. 4	Alt. F5
P	3	4	3	3	3	3
SPNM	5	5	2	2	4	2
SPM	—	—	—	—	—	—
RN	2	2	—	—	2	—
R	—	—	—	—	—	—
RM	11	10	16	16	12	16
Total	21	21	21	21	21	21

SOURCE: Forest Service, Ketchikan Area, database.

Key:

—	=	No existing
P	=	Primitive
SPNM	=	Semi-Primitive Non-Motorized
SPM	=	Semi-Primitive Motorized
RN	=	Roaded Natural
R	=	Rural
RM	=	Roaded Modified

In summary, none of the alternatives would significantly change the ROS settings of existing recreation sites primarily because the majority of sites are already located in roaded ROS settings. There would be a slightly greater effect on potential recreation sites. The alternatives would result in a slight increase in recreational sites catering to recreationists desiring a roaded setting, and a slight decrease in the number of recreation sites available for recreationists desiring unroaded settings.

Effects on Activities and Use Patterns

Timber harvesting affects different recreational activities in different ways. Activities that do not require semi-primitive or primitive settings would be less affected by timber harvest than activities in which participants desire an unroaded or primitive setting. The introduction of roads into previously unroaded areas, could potentially allow people to access areas by vehicle or foot that were previously difficult to reach. If the roads are maintained, vehicular access can be provided, and if roads are not maintained, road beds can be used as trails until vegetation growth restricts use.

The following sections discuss how some of the major recreational activities that occur in the Project Area could be affected by the alternatives and how participation in those activities might change.

Viewing Scenery and Automobile Travel

Viewing scenery was estimated to be the most popular recreational activity in the Craig Ranger District. It can be assumed people who rated viewing scenery as their primary activity also participated in other activities, and people who identified other activities as their primary activities also viewed scenery. With the exception of viewers flying over the Project Area (estimated to be the seventh most popular activity), most viewers would either view scenery from roads or from the water. The following discusses the general effects that the alternatives would have on viewing scenery. For a detailed examination of the effects the alternatives would have on visual resources, see the *Visual Quality* section.

For recreationists viewing scenery from one of the Project Area's three primary roads (the Hollis-Klawock Highway, Hydaburg Road, or Forest Road 21), the differences between the alternatives in terms of the number of timber harvest units seen from the three roads would not be great. Several harvest units included in all the alternatives are near or adjacent to Hydaburg Road and Forest Service Road 21 (the Polk Inlet road) and would be visible from those roads. The most significant differences between the alternatives for recreationists viewing scenery from roads would be differences in the number of harvest units seen from the overlook built by the Alaska Department of Transportation and Public Facilities on the Hollis-Klawock Highway. The overlook is located several miles west of the Hollis Ferry terminal; from it, viewers can see into the Harris River drainage and much of the northeast headland area (the Headlands) of Twelvemile Arm. Only Alternative 3 would have harvest units that could be seen from the observation lookout. Six units located in the Harris River drainage and the Headlands would be visible from the overlook.

Recreationists could also view timber harvest activities from the Project Area waters. The body of water that receives the greatest amount of recreational use in the Project Area and that would be viewed by the greatest number of recreationists is Twelvemile Arm. The effects of the alternatives on recreationists using Twelvemile Arm are discussed in Effects of Recreation by VCU under VCU 621.

Polk Inlet, McKenzie Inlet, and the West Arm of Cholmondeley Sound also receive recreational use, and recreationists would be able to view some of the harvest units from the waters of those inlets. Timber harvest activities and the impacts to recreationists viewing scenery in Polk Inlet would be similar in all of the alternatives except Alternative 3. Alternative 3 would postpone additional timber harvest on the east side of Polk to some time in the future. Alternatives F2, 3, and F5 all would postpone harvest in McKenzie Inlet. The timber harvest activities that would occur along Cannery Creek near Cholmondeley Sound with Alternative 4 and near Sunny Cove with Alternative 3 would be visible to varying degrees, but would not be as visible as harvest activities in the other inlets.

As discussed in Section 3, automobile travel was estimated to be the second most popular recreational activity in the Craig Ranger District. The alternatives would create new roads, some of which would allow access to parts of the Project Area that are not currently accessible by road. Because some roads would be closed for management purposes and other roads would be too rough for general public access by non-four- wheel drive passenger vehicles, the alternatives would not create a great increase in the amount of road that would be available for the public to drive after completion of harvest activities. The most significant new roads that would remain open to the general public upon completion of harvest activities would be the road to Harvest Units 291 and 349 in VCU 620, which is included in Alternatives F2, 4, and F5, and the road to Harvest Unit 218 in VCU 613 in Alternatives 3 and 4. The road to Units 291 and 349 would provide access to near an unnamed lake and alpine area. The road to Harvest Unit 218, with pullover areas for parking, would allow vehicles access to the Upper Old Frank Lake area and a trail that could potentially be developed there.

McKenzie Inlet

Power Boating

There would be two potential effects of timber harvest activities on boating in the Project Area. The first would be the change in aesthetic quality in the Project Area that would result from harvest activities. Boaters that currently use parts of the Project Area where harvest activities are not present, or are not prominent, might find harvest activities and the resulting clearcuts aesthetically objectionable. These boaters would either stop using the Project Area and go elsewhere, or adapt to the new aesthetic and visual conditions.

The second and less significant effect harvest activities could have on boating would be the increase in use of the waters of the Project Area for timber harvest operations. The establishment of LTF's, the dropping of logs into inlets by helicopter, and the transport of log rafts would create activities on Project Area waters that boaters might find objectional, and that could create hazards.

Hunting and Fishing

The Sitka black-tailed deer is the most popular game species in the Project Area, and can be used as a barometer for what the potential effects of timber harvest to recreational hunting would be. Timber harvest activities can impact the hunting of Sitka black-tailed deer in several ways. Perhaps the most significant impact is the loss of habitat (particularly winter range) associated with harvesting, resulting in population declines.

As discussed in *Wildlife*, the loss of habitat as a result of the alternatives would have an impact on the number of animals potentially available to hunt in the Project Area. Declines in deer habitat capability as a result of the action alternatives would reduce deer habitat capability

between 1 percent (Alternatives F2 and F5) and 2 percent (Alternatives 3 and 4) from existing conditions (Table 4-39); therefore, the potential number of deer available for hunting would be expected to undergo a proportional decline.

Although the number of most game species in the Project Area is not expected to decrease significantly as a result of timber harvest, the introduction of roads into the Project Area would affect recreational hunting. New roads that would be open during harvest activities and roads that would remain open after the completion of harvest activities would allow hunters easier access to areas that were previously difficult to reach. Roads that would remain open would allow vehicular access by hunters, and roads that would be closed would allow foot access until the regrowth of vegetation would make them impassable.

Easier access for hunters could result in population declines in the Project Area. By allowing access into remote areas, there could be a reduction in the amount of undisturbed area used by animals for refuge and a resulting population displacement. In addition, providing easier access to remote areas could increase the number of animals harvested, and perhaps cause a decline in population.

Timber harvest and related activities could affect the quality of the hunting experience for hunters that prefer to hunt in pristine or less-developed areas. Some hunters might be displaced to other less-developed areas. As a result, there could be increases in the number of hunters in those areas. Other hunters, on the other hand, might not be bothered by the aesthetic consequences of harvest activities, or might be willing to ignore them to have easier access to areas in which to hunt.

The effects of the alternatives on Sitka black-tailed deer and other wildlife species are discussed in more detail in *Wildlife*. The effects of the alternatives on subsistence hunting are discussed in *Subsistence*.

Timber harvest can affect an area's fisheries and, as a result, recreational fishing. However, as stated in the *Water, Fish, and Fisheries* section, there should be no significant effects to freshwater or saltwater fish resources as a result of implementing any of the alternatives. Mitigative actions already taken, and future actions associated with implementation, would protect freshwater fish resources in the Project Area.

Although timber harvest in the Project Area is not expected to significantly affect freshwater and saltwater fisheries, it would be expected to affect recreational fishing in two ways. The first would be by allowing motorized access to areas previously difficult to reach. Although most roads would not be maintained after harvest, two roads would remain open to provide recreational access to Old Franks Lake in VCU 613 and to near an unnamed lake near Harvest Unit 349 in VCU 620. These roads would provide access to areas with fishing potential that are currently difficult to access.

The second way harvest activities would be expected to affect recreational activities would be by altering the recreational setting. As with hunters, some anglers prefer pristine or less-developed settings in which to fish. For those anglers, the aesthetic effects of timber harvest and harvest activities might dissuade them from fishing in the Project Area. As a result, they might be displaced to other less-developed areas, and could increase recreational pressures in those areas to an unknown (but not expected to be great) degree.

One Duck Shelter

Other Activities

Existing and potential developed day-use facilities are not located close enough to any proposed harvest units to be directly affected by harvesting activities. The primary effects to recreationists at day-use facilities would be from logging trucks driving past the sites, and the resulting noise and dust created by the trucks.

Timber harvest would have varying effects on the potential recreation cabins and camping sites identified in the Project Area. Generic effects of timber harvest to recreationists using the camping areas and cabins would include: a change in visual quality, landscape character, and remoteness (for some facilities) as a result of harvest activity; noise and dust from nearby harvest activities and roads; and increased traffic and visitation at those facilities located near roads. The specific effects on recreation cabins and camping areas are discussed in more detail below, under the appropriate VCU discussion.

Most of the established trails in the Project Area are not located near any proposed harvest activities and would not be affected by harvesting under any of the alternatives. The only established or potential hiking trail identified by the Forest Service that would be affected by timber harvest would be the potential One Duck Trail extension. The description of the effects to it are discussed below, under VCU 622.

The potential trail in the Old Tom Creek Research Natural Area has not been located, but would be a desirable addition to recreation in the Project Area. One possibility under Alternatives 3 and 4 would be to establish a trail from where the road (that would continue to be maintained after harvesting) ends near Lower Old Franks Lake to Lower Old Franks Lake and Old Franks Creek.

Commercial Outfitters and Guides

As discussed in the *Recreation* section in Chapter 3, it is difficult to establish the amount of use the Project Area receives from outfitters and guides. Outfitters and guides have expressed interest in 24 special use permits from the Forest Service for streams in the Project Area.

In 1985, Bright surveyed 72 "access-oriented" outfitters who operated in Southeast Alaska to determine, among other things, what environmental qualities were important for their businesses. The outfitters and guides reported that the five most important characteristics of an area were, in descending importance, scenery, wilderness, wildlife, fishing, and solitude. The single most frequently mentioned activity (by 34 percent of the respondents) that would cause outfitters and guides to avoid an area was timber harvest and its related activities. The second most frequently mentioned activity was "heavy use" of an area by other people (Bright 1985).

The alternatives would all involve harvest operations and the possible establishment of logging facilities and, or camps that would change some of the "scenery" and "wilderness" characteristics of the Project Area. As a result of new roads, all the alternatives would potentially allow more people to access areas near harvest activities and would increase recreational use in areas previously difficult to access. The alternatives would affect and change outfitter and guide use of the Project Area to different degrees. The following describes the effects the alternatives would likely have on outfitters and guides.

The alternatives with the most harvest units in an inlet would likely have the greatest negative effects on outfitter and guide use of an inlet and its adjacent land and streams. Alternatives F2, 3, 4, and F5 would introduce from 4 to 13 new units into Twelvemile Arm that would likely negatively affect outfitter and guide use of the inlet. Alternatives F2, 4, and F5 would have the same effects on Polk Inlet, and Alternative 4 would have a similar effect on McKenzie Inlet. Alternative 3 harvest activities could have some negative effects on use of the Sunny Cove area, and Alternative 4 harvesting could likewise affect use of the Cannery Creek area.

Effects of Timber Industry Facilities and Employees

The establishment of logging facilities, such as camps and LTF's, in remote areas affects recreation near the facility for the life of the facility. Logging personnel presumably partake in at least some of the recreational opportunities available near facilities, particularly near logging camps. Activities such as fishing and hunting would be expected to be particularly popular. Impacts to local fish and game populations from employee hunting and fishing activities would be difficult to predict. Impacts to subsistence users and other recreationists as a result of employees hunting and fishing in an area would also be difficult to estimate.

The existence of logging facilities in remote areas could affect recreational users by their very existence. Recreationists expecting pristine, primitive settings for recreational activities might find an area with logging facilities unacceptable. The visual and aural impacts of the facilities and the presence of employees could cause some recreationists and outfitters to avoid an area altogether.

Road Management

The introduction of roads into previously unroaded areas has both positive and negative consequences for recreation. The negative consequences can be attributed to changes in the characteristics and attributes of unroaded areas and to the resulting impacts to recreation activities that require those attributes. On the other hand, roads can make an area accessible for recreational activities that do not require unroaded characteristics and attributes.

Some of the roads that would be built under the various alternatives would remain open to allow for recreational access. Others new roads would be closed to vehicular access to protect resources such as big game. Two roads would be left open after the completion of timber harvest to allow for recreational access by the public. The road to Harvest Unit 218 in the Old Franks Lake area would be maintained in Alternatives 3 and 4 to allow motorized recreational access. In addition, the road to Harvest Unit 291 in VCU 620 in Alternatives F2 and 4 would remain open to provide roaded access to an area from where recreationists would have walking access to an alpine area and unnamed lake. Under Mitigation below, both roads are described in more detail.

Effects on Recreation by VCU

This section examines what the effects would be on recreational resources in each VCU as a result of implementing the alternatives. It examines the effects if any, the alternatives would have on existing and potential recreational places and sites, and discusses effects on dispersed recreation. Recreational opportunities that could result from implementing the alternatives are also discussed.

VCU 610 (Maybeso)

There are no existing or potential recreation sites in VCU 610 and dispersed recreation currently is estimated to be low and to remain low in the foreseeable future.

VCU 611 (North and East of Hollis)

There are no existing or potential recreation sites in VCU 611. However, fishing and boating activities occur in Twelvemile Arm. Recreationists and people in Hollis would be able to observe harvest units and logging roads scheduled in the section of VCU 611 southeast of Hollis under Alternative 3. New Alternative 3 logging roads would allow vehicular access to upland areas southeast of Hollis, although there are no developed recreational resources there.

VCU 612 (Kina Cove Uplands)

There are no existing or potential recreation sites identified by the Forest Service in VCU 612. Alternatives F2, 4, and F5 would introduce new roads to the area, but the roads would only be accessible for drivers who could get to the LTF east of Saltery Cove and therefore would not be accessible to the general public. The roads would also likely be closed to the public upon completion of harvest activities.

VCU 613 (Old Franks Creek)

Much of the area near the Old Franks Lake and Creek is included in the Old Franks Creek recreation area. There are no existing or potential recreation sites identified in VCU 613. However, there is a dispersed campsite on the southern shore of Upper Old Franks Lake.

Alternatives 3 and 4 would introduce logging roads into the Old Franks Lake area and make some of the recreation place accessible by motor vehicle to Hydaburg Road and the rest of Prince of Wales. The Recreation Development Priority List created by the Forest Service after surveying Prince of Wales residents, indicated that there is a medium public support for a trail into the Old Franks Lake area. By keeping the road to Harvest Unit 218 open upon the completion of harvest activities, road access to trails that could be established in the Old Franks Lake area could be provided. If road access were provided and trails developed, the number of recreationists in the area would increase. Because of the area's excellent fishing and hunting potential, the number of anglers and hunters would particularly be expected to increase. Other types of recreation such as dispersed camping and canoeing on the area's lakes and streams would also be expected to occur.

VCU 618 (Skowl Arm and McKenzie Inlet)

There are several existing and potential recreation sites in VCU 618 that would be affected to varying degrees by the alternatives.

Recreationists using an anchorage at Thumb Point near the entrance to McKenzie Inlet would view one 68-acre harvest unit (618-209) with Alternative 4 (see *Visual Resources* section, Photopoint 16). Recreationists boating to the existing Forest Service anchorage site or to the potential Forest Service dispersed camp site located at the end of McKenzie Inlet would also view the proposed unit. Alternative 4 would introduce 3 harvest units to McKenzie Inlet that would be visible to varying degrees from different locations in the inlet. The new harvest units, along with the units scheduled to be harvested, would negatively affect the quality of experience for many recreational users of McKenzie Inlet.

VCU 619 (Upper Polk Inlet)

Alternatives F2, 4, and F5 would introduce harvest units into VCU 619. All would be located in the upland area west of the middle section of Polk Inlet and would not be visible from the waters of Polk Inlet. Roads to the units could allow motor vehicle access to upland areas previously inaccessible to motor vehicles, although the roads would not be maintained to allow recreational access.

VCU 620 (Lower Polk Inlet)

A number of existing and potential recreation sites in Polk Inlet and the surrounding area could be affected by the alternatives.

Several existing and potential Forest Service recreation sites in VCU 620 would be affected by Alternatives F2, 4, and F5. Harvest Units 307 and 325 (in Alternatives F2 and 4) would be close to a potential Forest Service family campground near the head of Polk Inlet and would be seen from the road to the campground. Although the potential campground is located in a ROS setting of RM, the harvest activities would change the visual characteristics of the campground environment. If the campground is in use prior to, or during, timber harvest activities, logging traffic and harvest activities near the campground could cause noise and safety concerns. In addition, six to seven harvest units included in Alternatives F2, 4, and F5 could be seen from the existing Forest Service observation recreation site near the head of the inlet and from the area near a potential observation site located at a lake east of the units.

Harvest Unit 209 (in all action alternatives except F5) would be visible from Dog Salmon Lake, which is an existing Forest Service (observation) recreation site. The lake is currently accessible by a road located above it approximately 100 to 200 feet to the east. Although the site is currently in a ROS setting of RM, harvesting Unit 209 and building the proposed new road around the south and west side of the lake to it would negatively change the visual characteristics of Dog Salmon Lake for many recreationists.

New roads in VCU 621 (the roads to Harvest Units 291, 349, and 285) would be visible to varying degrees to recreationists driving around the southern Polk Inlet roads or boating on the inlet. The road to Harvest Unit 291, however, (Alternatives F2, 4, and F5) would remain open to recreational users. It would provide new access within approximately 0.25 mile of an unnamed lake and alpine area that would likely be used for fishing, hunting, and other dispersed recreation.

VCU 621 (Twelvemile Arm)

Twelvemile Arm receives relatively heavy use, particularly from residents of Hollis. The low number of Forest Service recreation sites (one existing, two potential) is not reflective of the inlet's importance to local recreation. The only existing or potential Forest Service recreation sites that would be directly affected by harvest units would be a potential recreation cabin and a proposed family campground, both of which would be located on the east side of the inlet, approximately 1 mile north of the inlet's head. Harvest Units 268 and 255 would be visible from the potential cabin and campground (which has been identified as a high priority project by the Forest Service). If the cabin and campground were established and in use prior to or during timber harvest, noise and other timber harvest activities could affect the quality of experience for recreationists using the facilities.

Recreationists accessing the recreation sites by water or air, or simply boating or flying in Twelvemile Arm, would view many of the proposed clearcuts and logging roads on the hills flanking Twelvemile Arm. All the alternatives propose timber harvesting on the hillsides of Twelvemile Arm. However, the alternatives would have different effects on the visual character of Twelvemile Arm and therefore different effects on recreationists using the inlet. Alternative F2 and F5 would establish the least number of harvest units (one) visible from the water of all the alternatives, and would have the least visual impact to recreationists. The single harvest unit would be located on the east side of the inlet. Alternatives 3 and 4 would establish five harvest units that would be visible from the potential campground.

Alternative 4 would result in up to 14 harvest units being visible to recreationists as they moved through the inlet. The harvest units would be visible from many parts of Twelvemile Arm. Alternative 3 would be very similar to Alternative 4, but would have four additional harvest units located in the inlet that would be visible from the water. Both alternatives would

require new roads, some of which would be visible from the waters of Twelvemile Arm and all of which would provide recreational access while timber harvest activities continued. Although the proposed logging roads in Twelvemile Arm would open up previously inaccessible upland areas to recreationists, none would be maintained to provide recreational access upon completion of harvest activities.

VCU 622 (Hollis and Harris River Area)

VCU 622 has the greatest number of existing and potential recreation sites (11) of any VCU in the Project Area. Within the VCU are a number of recreation sites that support land-based recreation activities.

The most significant impact to recreation that would occur in VCU 622 as a result of the alternatives would be the introduction of helicopter units under Alternatives F2, 3, and F5 to the upland area near the existing One Duck Shelter and proposed extension of One Duck Trail. Harvesting the helicopter units would change the ROS setting from SPNM to RM, and would affect the remote character of the area near the shelter and trail during harvest. Harvest Unit 273 would be located approximately 0.25 miles south of the One Duck Shelter, and would be visible to people hiking on the several dispersed trails that weave through the alpine area near the shelter. The harvest unit would be most visible from dispersed overlook points on the south side of the alpine area which allow views of surrounding mountains. From the potential future 6-mile extension of One Duck Trail, helicopter Harvest Units 249, 255, and 257 would be visible to varying degrees and would change the pristine visual character of the areas near them.

Another existing recreation site that would be affected by timber harvest, would be the Hollis-Klawock overlook built by the Alaska Department of Transportation and Public Facilities (see the *Visual Resources* section, Photopoint 4). Viewers from the overlook would be able to see varying numbers of harvest units depending upon the alternative.

Proposed logging roads in VCU 622 would not have any significant effects on recreation in the VCU and would not create significant permanent new access opportunities. The road through Harvest Unit 269 that leads to harvest units along the west side of Twelvemile Arm would allow recreational access to the highlands near the units for the duration of harvest activities. However, the road would not be maintained for recreational access upon completion of harvest activities.

VCU 674 (West Arm Cholmondeley Sound and Big Creek)

Much of VCU 674 is included in the West Arm of Cholmondeley Sound recreation place. Two existing and two proposed Forest Service recreation sites are within the recreation place. However, all four sites are located near the west end of the West Arm of Cholmondeley Sound, in or near land that has been selected by the Haida Corporation. The harvest units proposed in Alternative 4 would occur near Cannery Creek, and would not be visible from any of the Forest Service's existing or proposed sites. Part of Harvest Unit 265 would be visible, however, to recreationists on the water in the sound off of Cannery Creek with Alternative 4. The primary effect of the proposed timber harvest activities near Cannery Creek on recreation would be the resulting change in landscape character as a result of timber harvest activities and the establishment of a road in an area that is pristine. The recreation place is currently used by recreationists seeking primitive settings for dispersed recreation and activities associated with timber harvest; consequently, log movement (the LTF and transporting log rafts) might be considered intrusive to some recreationists. Because the area of the harvest would not connect with the Prince of Wales Island road system, general public would not be able to access the area by road. Recreationists might be able to access the road by boat and walk along the road to participate in activities associated with roaded areas.

VCU 675 (Sunny Cove)

Part of VCU 675 is also included in the West Arm of Cholmondeley Sound recreation place. There are no existing or proposed Forest Service recreation sites in VCU 675. The area along Sunny Creek near the location of proposed harvest units under Alternative 3 is used by residents of Sunny Cove to an undetermined extent. A change in visual character and the installation of a logging road created by harvest activities would likely affect use of the area by residents. Road and LTF construction, along with harvest activities, would result in periodic noise, dust, and traffic near Sunny Cove. As a result, recreationists in the area could be disturbed. Although the road would not be maintained upon completion of harvest activities, it would likely be used by residents during and after the harvest period. The road would not be linked to any road system, so the general public would not be able to access the area by motor vehicle.

Roadless Areas

As scheduled and available commercial forest land is developed, the Polk Inlet roadless area (Roadless Area 519) will continue to be reduced in size as timber harvest activities proceed on both National Forest System and adjacent lands. The part of the Polk Inlet roadless area that lies within National Forest System land in the Project Area would be reduced in size and fragmented by all the alternatives. Alternative 1 would retain approximately 90,000 acres of National Forest System land in the Project Area as roadless. The roadless area would comprise approximately 54 percent of the total Project Area. As Table 4-95 illustrates, the amount of roadless area that would remain after harvest activities ceased would vary with each alternative. Alternative 3 would leave the least amount of roadless area—56,100 acres or 34 percent of the Project Area. Alternatives 4 and F5 would leave the largest amount of roadless area—71,100 and 71,300 acres or 43 and 43 percent of the Project Area, respectively.

Table 4-95
Roadless Area (in acres) and Percentage of Project Area by Alternative

	Alt. 1	Alt. 1a	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Acres	90,000	102,100	67,200	56,100	71,100	71,300
Percentage	54	61	40	34	43	43

SOURCE: Forest Service, Ketchikan Area, database.

Effects on Wild and Scenic Rivers

No harvest units proposed by any of the alternatives lie within the quarter-mile corridor adjacent to the Harris River or Big Creek. Both were recommended for inclusion into the National Wild and Scenic River System in Alternatives A and B of the TLMP Draft Revision, but not in the preferred alternative (Alternative P). None of the proposed units would be visible from either the Harris River or Big Creek.

Wilderness

None of the proposed harvest units in any of the alternatives would be located near the Karta Wilderness. The closest units would be Units 207, 214, and 215 in VCU 611, which, under Alternative 3, would be located approximately 5 miles to the southeast of the wilderness.

Cumulative Effects

Although increases in the amount of recreational use and visitation in the Project Area is difficult to determine, recreational use and visitation in the Tongass National Forest and on Prince of Wales Island has increased rapidly in the past few years. Past and current studies indicate the main attractions for visitors and recreationists include scenery, wildlife, feelings of remoteness, and a sense of vastness. These trends are likely to continue. The marine environment and undeveloped character of the Tongass National Forest and Prince of Wales Island play an important role in attracting recreationists and in meeting their expectations. Tourism is also tied directly to the natural scenery, vastness, and remoteness of the area. Some of the tourism opportunities from cruiseships and the like will remain unaffected as long as scenery along critical travel routes remains natural-appearing.

Prince of Wales Island has more miles of road and more opportunities for roaded recreation than any location in Southeast Alaska. As timber harvest continues, more roads will be developed, some of which will allow for additional recreational access to areas that have been unroaded. The new roads and harvest activities will change forest settings and recreational opportunities.

As the Project Area changes over time, so may the makeup of visitors and the activities in which they engage. As the complexion of the forest setting and associated recreation resources changes, recreationists will have three general options. Some current users will adapt to the new situations and changes in ROS settings. . For others, the changes may not be acceptable; these users would be displaced to other areas where the setting and use patterns are more in line with their expectations and needs. A third type of recreationist may find they can neither adapt to the new situation nor find areas to be displaced to, and thus may find substitutes for their traditional leisure time activities.

As use and demand increase over time, social encounters will increase and more competition for resources will occur. This may not have a great impact in modified setting but may in undeveloped settings. As P and SPNM settings are reduced, conflicts between users will likely increase as well, with the degree of conflict relative to the amount of change. This conflict may be between user groups engaged in different activities, such as motorized versus nonmotorized, or between residents and nonresidents vying for the same unique opportunities with few substitutes.

Recreational Opportunity Spectrum

Prior to the Long-term Contract, the vast majority of Prince of Wales Island would have been inventoried with ROS settings of SPNM or P. Timber harvest activities have changed the landscape of parts of Prince of Wales Island, and have introduced roads and opportunities for roaded recreation into unroaded areas. As a result, the amount of unroaded land previously classified as SPNM or P has decreased, and opportunities for nonroaded recreation in those areas has diminished.

The TLMP indicates the fastest growing recreational activity demands in Tongass National Forest are those associated with SPM ROS settings. Activities associated with P and SPNM settings are the second most popular and second fastest growing activities. The activities least in demand, but also growing, are those associated with Roaded Natural and Roaded Modified settings (TLMP Draft Revision 1991a).

Good fishing offers one of the more popular forms of recreation in the Project Area.

Setting changes are generally recognized as a one-way street, moving toward the developed end of the ROS spectrum. Timber harvest will reduce the amount of SPNM settings available to recreationists and increase the amount of roaded area available. Given enough time, however, settings in the Southeast Alaska rainforest can revert back to semi-primitive conditions.

Harvest activities on National Forest System land in the Project Area would increase roaded recreational opportunities within the Project Area. Opportunities for recreation requiring roadless areas would be reduced in the Project Area, thus, moving the character of the Project Area toward the desired future condition identified in TLMP.

All of the alternatives would result in changes in the amount of nonroaded and roaded areas in the Project Area. Providing roaded recreation opportunities is consistent with the TLMP desired future condition for the Project Area. Most of the Project Area has been designated in the TLMP with a LUD of Timber Production. In such areas, timber harvest in previously unroaded areas is consistent with the designation of Timber Production, as long as the Timber Production recreation standards and guidelines are met. The recreation standards and guidelines state that, "where scheduled activities change in the recreation setting, [an agency should] manage the new setting in accordance with the appropriate ROS guidelines."

Recreation Sites

As with ROS settings, timber harvest activities are changing the recreational experiences available at specific recreation sites. As new roads are built for timber harvest, remote recreation sites will become accessible to more people. All of the alternatives involve the construction of new roads, some of which would make existing and potential recreation sites accessible by road. As the Prince of Wales Island road system expands as a result of timber harvest activities, people will have more areas to visit via motor vehicle. As more people visit the island, there will be greater use of recreation sites, particularly those accessible by road.

For those recreationists that desire less accessible, more natural-appearing recreation sites, roads and timber harvest activities will likely have a negative effect on their satisfaction levels. The opportunities for recreating at remote, undisturbed recreation sites will decrease throughout Prince of Wales Island as roads reach many remote sites and harvest activities change the character of the landscape near those sites. As a result, recreationists desiring remote, unroaded recreation sites will have fewer choices on Prince of Wales Island. All the alternatives would result in a reduction in the amount of land available for activities in which participants desire unroaded, natural areas.

Recreational Activities

The changes to ROS settings and recreation sites on Prince of Wales Island as a result of timber harvesting activities are having effects on the types of recreational activities that occur on Prince of Wales Island. As more roads are constructed, access to previously remote areas becomes possible and the opportunities for activities such as driving, sightseeing, and camping in Roaded Modified ROS settings increase. Opportunities for activities such as fishing and hunting also increase, although easier access may result in harvest rates that negatively affect fish and game populations.

Activities in which participants require or desire secluded, natural settings (such as the clients of outfitters and guides) are affected by the changes to the landscape and road building that result from timber harvest activities. Therefore, if the scenery of an area changes as a result of timber harvest, or if an area is perceived as being crowded as a result of receiving more use (i.e., as a result of road access), recreationists may not use that area. As more remote areas on Prince of Wales Island are entered for timber harvest, the number of suitable locations for those recreationists seeking secluded, uncrowded areas decreases, and recreationists must find new suitable locations. Remaining areas, such as the Karta Wilderness, would be expected to receive additional use as there is a reduction in undisturbed areas.

Mitigation

The following mitigation measures would help reduce the adverse effects of timber harvest and associated activities on recreational resources.

1. Potential harvest units near One Duck Lake in VCU 622 were deferred from the pool of potential harvest units and Units 622-247 and 622-273 were prescribed for partial cuts in part to reduce the effects of timber harvest activities would have on recreation at One Duck Lake trail and shelter (Mitigation Measure R1).

2. The proposed family campground and recreation cabin which would be located in the southeast corner of the inlet would be sited to minimize views of harvest units across the inlet on the west side of Twelvemile Arm (Mitigation Measure V5). These facilities should be sited in the field during construction by landscape architecture and recreation specialists.

3. In VCU 620 between the southern ends of Polk Inlet and Old Tom Research Natural Areas, 1.5 miles of the new road to Harvest Units 620-349 and 620-291 should remain open to allow access to an unnamed lake uphill from the road. A three-car pullover area would also be provided. Recreational access along the road to these harvest units would be encouraged and the road would be provided with enough turnouts to provide safety for recreationists driving the mountainous road. It would be constructed to Traffic Service Level C (Mitigation Measure R2).

4. In VCU 613, the new road to Harvest Unit 613-218 (the Old Franks Lake area) would remain open to the southwestern uphill edge of the Harvest unit. 218. Recreational access along the road would be encouraged and it would be constructed to Traffic Service Level C. The road would provide access to Upper Old Franks Lake. Road closure beyond Harvest Unit 613-218 would permit access to the lower lake only by trail or by canoe from the upper lake (Mitigation Measure R4). Recreation, fisheries, soils and engineering specialists would work together to locate the road close to the upper lake (no closer than 200 feet, however) without impacting the stream, lake, and adjacent riparian areas. Two or three vehicle parking areas, large enough to park three to four vehicles along the road would be located and access points and trails from parking areas to the stream and lake shores would be sited.

5. All road construction slash and debris generated from ROW clearing of roads that would be used for recreational access, such as the road to Harvest Unit 613-228 (near Old Franks Lake), is recommended to be buried in the road prism or hauled to designated disposal areas (Mitigation Measure R5).

Monitoring

The TLMP Draft Revision (1991a) proposes that ROS settings be reviewed annually to verify consistency with the Forest Plan (Recreation Monitoring Item 1). In addition, visual quality objectives (VQO's) are to be monitored to verify compliance with adopted VQO's (Visual Resource Monitoring Item 1).

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Other Environmental Considerations

Irreversible Commitments of Resources

Irreversible commitments are decisions affecting nonrenewable resources such as soils, wetlands, unroaded areas, and cultural resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or because the resource has been destroyed or removed.

The construction of roads, to provide access to the Forest, is an irreversible action because of the time it takes for a constructed road to revert to natural conditions. Irreversible actions also include the associated rock quarries which are developed in conjunction with these roads. Alternative 1 would have no new road construction while Alternatives F2, 3, 4, and F5 would construct about 50 miles of new roads. This would require that approximately 550 acres of ground be irreversibly committed to roads, landings, and rock quarries under the worst-case assumption that the roads will commit a 75-foot-wide corridor. Alternative 1a would prevent or defer the development of about 35 miles of new roads. Under this alternative, the irreversible commitment of about 400 acres to roads, landings, and rock quarries would be avoided.

After full implementation of the 1989-94 EIS, there will be approximately 90,000 acres of roadless area as identified in the TLMP Draft Revision (Forest Service 1991a) that might be affected by the Polk Inlet Project. A decision to develop these roadless areas would mean that their primitive character in terms of opportunities for solitude, remoteness, and development of wilderness skills would irreversibly be gone. Table 4-95 shows the number of roadless acres and percentage of Project Area by alternative. Under the range of action alternatives (Alternatives F2 to F5), approximately 18,700 to 33,900 acres of currently roadless area would be irreversibly committed. Alternative 1a would prevent the commitment of about 12,100 roadless acres.

Old-growth habitat lost due to logging could be considered an irreversible effect since it is not expected to regain old-growth characteristics for at least 200 years. From 2,857 to 4,016 acres of old growth in volume classes 4-7 would be harvested in Alternatives F2 through F5.

Loss of soil due to erosion and mass failures is an irreversible commitment. However, due to the incorporation of Best Management Practices (BMP's), Forest Plan standards and guidelines, and mitigation measures specified in this document, it is not anticipated that there would be any significant soil loss under any alternative.

Loss of cultural resource sites resulting from accidental damage or vandalism would be an irreversible commitment of resources. The standards and guidelines, survey methodology prior to activities, and mitigation measures specified in this document provide reasonable assurance that there would be no irreversible loss of cultural resources.

Irretrievable Commitments

Irretrievable commitment of natural resources means loss of production or use of resources because of management decisions made in the alternative. This represents opportunities foregone for the period of time that the resource cannot be used.

The reduction in the visual quality of an area because of timber harvesting will be an irretrievable commitment of resources. The commitment is irretrievable since viewsheds will typically heal from a visual quality standpoint after about 40 years. After this time, the second-growth

trees will have the color and height needed so as not to be evident to the casual observer. Alternative 1 will have no irretrievable commitment of visual quality. Alternatives F2, 3, 4, and F5 will irretrievably commit visual resources because of timber harvesting.

Short-term Uses and Long-term Productivity

The use of natural resources for long-term sustained yield is at the basis of National Forest management and direction. The proposed timber harvesting under the BMP's, TLMP standards and guidelines, proposed Alternative P in the TLMP Draft Revision (1991a) standards and guidelines, and Regional Guide direction will result in no long-term loss in productivity.

Possible Conflict with Plans and Policies of Other Jurisdictions

The regulations for implementing NEPA require a determination of possible conflicts between the proposed action and the objectives of Federal, State, and local land-use plans, policies, and controls for the area. The major land-use regulations of concern are the Coastal Zone Management Act (CZMA), Section 810 of ANILCA, and the State of Alaska's Forest Practices Act. A discussion of each of these determinations is presented below.

Coastal Zone Management Act of 1976 (CZMA)

The CZMA was passed by Congress in 1976 and amended in 1990. This law requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that the activities or developments are consistent with approved state coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977 to establish a program that meets the requirements of the CZMA. It contains the standards and criteria for a determination of consistency for activities within the coastal zone.

Forest Service requirements for consistency are detailed in a Memorandum of Understanding between the State of Alaska and the Regional Forester, dated October 8, 1981. Standards against which the consistency evaluation will take place are: Forest Practices Act, Water, Air, Energy, and Environmental Conservation; and the Alaska Forest Practices Act of 1990.

The Forest Service has designed all alternatives to ensure that the activities and developments affecting the coastal zone are consistent with approved coastal management programs to the maximum extent practicable.

Alaska National Interest Lands Conservation Act of 1980 (ANILCA)

Under Section 810 of ANILCA, agencies are required to evaluate the effects of proposed actions on subsistence uses of Federal land and to determine if the proposed action may significantly restrict subsistence opportunities. Refer to the Subsistence section of this chapter for the evaluation of impacts to subsistence use as a result of the alternatives.

State of Alaska's Forest Practices Act of 1990

On May 11, 1990, the governor approved the legislature's major revision of the State's Forest Practices Act (FPA). The revised act significantly increases the State's role in protecting and managing important forest resources on State and private lands. The revised FPA will also affect National Forest management through its relationship to the Alaska Coastal Management Program and the Federal CZMA discussed above.

For National Forest timber operations such as proposed for the Polk Inlet Project the effect of the revised FPA is essentially two-fold. First, it clarifies that the revised FPA regulations are the standard which must be used for evaluating timber harvest activities on Federal lands for purposes of determining consistency to the maximum extent practicable with the Alaska Coastal Zone Management Program. Secondly, it calls for minimum 100-foot buffers on all Class I streams, and recognizes that consistency to the maximum extent possible for purposes of the Alaska Coastal Management Program is attainable in Federal timber harvest activities using specific methodologies which may differ from those required by the revised FPA or its implementing regulations.

The TTRA prohibited commercial timber harvesting within buffer zones established on all Class I streams and those Class II streams which flow directly into a Class I stream. Buffer zones have a minimum width of 100-feet slope distance from the edge of either side of the stream. In addition, the Forest Service is currently working with the Alaska State Division of Governmental Coordination on a revision of an agreement between the State and the Forest Service. This revised agreement will establish the policies and procedures for coordinating state review of Forest Service programs and activities, including those covered by the FPA and the Alaska Coastal Management Program.

The Forest Service will evaluate the alternatives prior to completion of the Final EIS and the ROD to ensure that the activities and developments specifically covered by the FPA are consistent with its provisions to the maximum extent possible.

Energy Requirements and Conservation Potential of Alternatives

The implementation of the proposed actions in the Project Area will require the expenditure of energy (consumption of fuel). The amount of energy used varies by alternative based on timber volume harvested and miles of road constructed or reconstructed. The direct effect of the alternatives on energy requirements would be attributed to timber harvest, road construction and reconstruction, and travel necessary to administer the timber sale. Indirect energy requirements include processing wood products and the transport of the products to secondary processors and consumers.

Fuel Consumption

Fuel consumption requirements were estimated as follows:

Timber Sale Preparation and Administration	1.56 gallons/MBF
Cable Logging	2 gallons/MBF
Helicopter Logging	8 gallons/MBF
Load, Haul, Dump, and Tow	8 gallons/MBF
Road Construction	4,000 gallons/mile
Road Maintenance	20 gallons/mile

The estimated total fuel consumption required for each alternative is displayed in Table 4-96.

Table 4-96
Estimated Fuel Consumption (millions of gallons)

	Alt. 1a	Alt. 1	Alt. F2	Alt. 3	Alt. 4	Alt. F5
Thousands of gallons	-1,008	0	1.60	1.88	1.68	1.29
Average gallons/MBF	13.4	0	14.8	15.8	14.1	14.7

SOURCE: Forest Service, Ketchikan Area, GIS database.

Note: The estimated fuel consumption for timber harvest activities is based on consumption per MBF of sawlog volume. Sawlog volume is estimated to be 79% of the total volume harvested.

Conservation Potential

To conserve fuel and/or minimize costs, the Forest Service has undertaken studies nationwide and on the Stikine area of the Tongass National Forest and allowed experimentation with new or different equipment or techniques. Shovel yarding is estimated to use 2.7 gallons of fuel per MBF, which is almost a gallon more per MBF than for cable yarding. However, savings are realized in employee costs. Crew size and labor cost per MBF is reduced with a crew of 1-2 versus an average of 4 for cable yarding.

The use of low tire pressure equipment (central tire inflation-CTI) during road construction and logging has also shown to decrease costs during studies nationwide and on the Stikine Area of the Tongass National Forest. Studies on Mitkof Island indicate that 10 to 14 percent less rock was needed during road construction, resulting in cost savings of approximately $450,000. It is predicted that costs for rock replacement/road maintenance, log truck fuel, and tire repair and replacement, will be decreased. Cost savings have proven to be substantial enough that the Forest Service provides a contract clause allowing a reduction in rock replacement deposits when low tire pressure equipment is used.

The use of cable yarding equipment fitted with mechanical or hydraulic interlocks, provides the ability to decrease yarding expense as the throttle and brake do not have to be rode simultaneously to provide deflection for the turn of logs.

Natural or Depletable Resource Requirements and Conservation Potential of Alternatives

All alternatives considered in detail are designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulation of mineral and energy activities on the National Forest, under the U.S. Mining Laws Act of 1872 and the Mineral Leasing Act of 1920, is shared with the Bureau of Land Management (BLM). The demand for access to National Forest system lands for the purpose of mineral and energy exploration and development is expected to increase over time.

The action alternatives propose road construction that will increase opportunities for access to the National Forest within the Project Area. This increased access may result in increased activity with regard to both known and potential mineral or energy resource occurrences. There are two mining claims within the Project Area. The actual potential for increased mineral or

are two mining claims within the Project Area. The actual potential for increased mineral or energy resource activity in the Project Area is not known, nor can an accurate estimate be made.

Urban Quality, Historic and Cultural Resources, and the Design of the Built Environment

The Project Area contains no urban areas. Therefore, the only applicable concern under this topic is with historic and cultural resources. The goal of the Forest Service's Cultural Resource Management Program is to preserve significant cultural resources in their field setting and ensure they remain available in the future for research, social/cultural purposes, recreation, and education. The direct, indirect, and cumulative effects of the alternatives on cultural resources have been evaluated. The result of this evaluation is the determination that there are adequate standards, guidelines, and procedures to protect cultural resources and to meet the goals of the Cultural Resource Management Program. Cultural resources are discussed further in the Cultural section of this chapter.

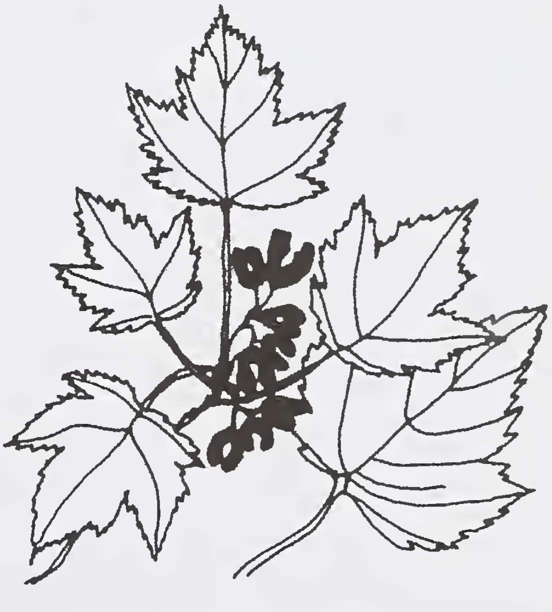
Effects of Alternatives on Consumers, Civil Rights, Minorities, and Women

All Forest Service actions have the potential to produce some form of impact, positive and/or negative, on the civil rights of individuals or groups, including minorities and women. The need to conduct an analysis of this potential impact is required by Forest Service Manual and Forest Service Handbook direction. The purpose of the impact analysis is to determine the scope, intensity, duration, and direction of impacts resulting from a proposed action. For environmental or natural resource actions, such as proposed for the Project Area, the civil rights impact analysis is an integral part of the procedures and variables associated with the social impact analysis. This analysis is discussed in the *Economic and Social Environment* section of this chapter.

The effect of the alternatives on consumers is reflected in the discussion of the various goods and services supplied as a result of the proposed actions. This analysis occurs throughout the chapter as an integral part of the analysis of the effects on other components of the environment.

Effects of Alternatives on Prime Farmland, Rangeland, and Forest Land

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime land. The Project Area does not contain any prime farmlands or rangelands. Prime forest land does not apply to lands within the National Forest system. In all alternatives, lands administered by the Forest Service would be managed with a sensitivity to the effects on adjacent lands.



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Chapter 6

Glossary

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Glossary

Acronyms

ACMP	Alaska Coastal Management Program
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AHMU	Aquatic Habitat Management Unit
AMS	Analysis of the Management Situation, Tongass National Forest Land and Resource Management Plan Revision
ANCSA	Alaska Native Claims Settlement Act of 1971
ANILCA	Alaska National Interest Lands Conservation Act of 1980
ASQ	Allowable Sale Quantity
ATTF	Alaska Timber Task Force
ATV	All-terrain Vehicle
BBF	Billion board feet
BLM	Bureau of Land Management
BMP	Best Management Practice
CFL	Commercial Forest Land
CFR	Code of Federal Regulations
COE	Army Corps of Engineers
CZMA	Coastal Zone Management Act of 1976
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EVC	Existing/Expected Visual Condition
FEIS	Final Environmental Impact Statement
FPA	Forest Practices Act
FSH	Forest Service Handbook
FTE	Full-time Equivalent
GIS	Geographic Information System
GMU	Game Management Unit
IDT	Interdisciplinary Team
IPASS	Interactive Policy Analysis Simulation System
KPC	Ketchikan Pulp Corporation
KV	Knutsen-Vandenberg Act
LTF	Log Transfer Facility
LUD	Land Use Designation
LWD	Large Woody Debris
M	Modification
MA	Management Area
MBF	Thousand board feet

MIS	Management Indicator Species
MM	Maximum Modification
MMBF	Million board feet
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act of 1969 (as amended)
NFMA	National Forest Management Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
ORV	Off-road Vehicle
P	Preservation
PR	Partial Retention
PRIM	Primitive
R	Retention
RM	Roaded Modified
RMO	Road Management Objective
RN	Roaded Natural
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROT	Remain-open Temporary
RVD	Recreation Visitor Day
SHPO	State Historic Preservation Officer
SPM	Semi-Primitive Motorized
SPNM	Semi-Primitive Non-Motorized
TDS	Total Dissolved Solids
TIS	Transportation Inventory System
TLMP	Tongass Land Management Plan
TRUCS	Tongass Resource Use Cooperative Survey
TTRA	Tongass Timber Reform Act
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
VCU	Value Comparison Unit
VQO	Visual Quality Objective
WAA	Wildlife Analysis Area

Terms Used in Text

Access
The opportunity to approach, enter, and make use of public lands.

Access Management
Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands.

Alevin
Young salmon that are still attached to the yolk sac, which provides nourishment.

Aerial Harvest Systems
See Logging Systems

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Alaska Native Claims Settlement Act (ANCSA)
Approved December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

Alaska Pulp Corporation (APC)
Previously Alaska Lumber and Pulp Corporation.

All-terrain Vehicle (ATV)
A wheeled vehicle less than 40 inches wide.

Allowable Sale Quantity (ASQ)
ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity expressed as a board foot measure is calculated per timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest.

Alluvium
A deposit of sand or mud formed by moving water.

Alluvial Fan
A fan-shaped deposit of sand, gravel, and fine material made by a stream where it runs out onto a level plain or meets a slower stream.

Alpine/Subalpine Habitat
The region found on a mountain peak above 1,500-foot elevation.

Alternative
One of several policies, plans, or projects proposed for decision-making.

Amenity
Resource use, object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. Amenity values typically are those for which monetary values are not or cannot be established.

Anadromous Fish
Anadromous fish spend part of their lives in fresh water and part of their lives in salt water. Anadromous fish include pink, chum, coho, sockeye, and king salmon, and steel head trout. There are also anadromous Dolly Varden Char.

Analysis Area
An analysis area is a planning unit made up of two or more management areas identified in the Tongass Land Management Plan. This grouping of management areas is consistent with the area analysis direction found in the 1985-86 Tongass Land Management Plan Amendment.

Appraisal
See Timber Appraisal.

Aquatic Habitat Management Unit (AHMU)
A mapping unit that displays an identified value for aquatic resources. It is a mechanism for carrying out aquatic resource management policy.
Class I AHMU: Streams with anadromous or high quality sport fish habitat. Also included is the habitat upstream from a migration barrier known to have reasonable enhancement opportunities for anadromous fish.
Class II AHMU: Streams with resident fish populations and generally steep (6 to 15 percent) gradient (can also include streams from 0 to 6 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values and are separate from the high quality sport fishing systems included in Class I. They generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.
Class III AHMU: Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat.

Background
The distance part of a landscape. The seen or viewed area located from 3 to 5 miles to infinity from the viewer. See also Foreground and Middleground.

Beach Fringe Habitat
Habitat that occurs from the intertidal zone inland 500 feet, and islands of less than 50 acres.

Bedload
Sand, silt, and gravel, or soil and rock debris rolled along the bottom of a stream by the moving water.

Benthic
Refers to the substrate and organisms on the bottom of marine environments.

Best Management Practice
Practices used for the protection of water quality. BMP's are designed to prevent or reduce the amount of pollution from nonpoint sources or other adverse water quality impacts while meeting other goals and objectives. BMP's are standards to be achieved, not detailed or site-specific prescriptions or solutions. BMP's as defined in the USDA Forest Service Soil and Water Conservation Handbook are mandated for use in Region 10 under the Tongass Timber Reform Act.

Biological Diversity (Biodiversity)
The variety of life in all its forms and at all levels. This includes the various kinds and combinations of: genes; species of plants, animals, and microorganisms; populations; communities; and ecosystems. It also includes the physical and ecological processes that allow all levels to interact and survive. The most familiar level of biological diversity is the species level, which is the number and abundance of plants, animals, and microorganisms.

Board Foot
A unit of wood 12" X 12" X 1". One acre of commercial timber in Southeast Alaska yields on the average 18,000 to 34,000 board feet per acre (ranging from 8,000 to 90,000 board feet per acre). One million board feet (MMBF) would be the volume of wood covering one acre two feet thick. One million board feet yields approximately enough timber to build 120 houses.

Bog
An undrained or imperfectly drained area with a vegetation complex composed of sedges, shrubs, and sphagnum mosses, typically with peat formation. See also Muskeg.

Bole
Trunk of the tree.

Broadcast Burning
Burning or an area that has been clearcut to remove logging slash from the site. Broadcast burning is done to prepare sites for regeneration or improve wildlife habitat.

Brush Disposal
Cleanup and disposal of slash and other hazardous fuels within the forest or project areas.

Buffer
The Tongass Timber Reform Act requires that timber harvest be prohibited in an area no less than 100 feet of uncut timber in width on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is known as a buffer.

Candidate Species
Those species of plant or animal which are under consideration (by US Fish and Wildlife Service and National Marine Fisheries Service) for listing as threatened or endangered but which are provided no statutory protection under the Endangered Species Act.

Canopy
See Overstory.

Cant
A log partly or wholly cut and destined for further processing.

Capability
An evaluation of a resource's inherent potential for use.

Carrying Capacity
The maximum number of species that can be supported indefinitely by available resources in a given area.

Cave
Any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge and which is large enough to permit an individual to enter.

Cave Resources
Any material or substance occurring in caves on Federal lands, such as animal life, plant life, paleontological resources, cultural resources, sediments, minerals, speleogens and speleothems.

Channel Types
The defining of stream sections based on watershed runoff, landform relief, and geology.

Class I, II, III Streams
See Aquatic Habitat Management Units.

Clearcut
The harvesting in one cut of all trees on an area. The area harvested may be a patch, strip, or stand large enough to be mapped or recorded as a separate class in planning for sustained yield. Clearcut size on the Tongass National Forest is limited to 100 acres, except for specific conditions noted in the Alaska Regional Guide.

Climax
A community of plants and animals which is relatively stable over time and which represents the late stages of succession under the current climate and soil conditions.

Code of Federal Regulations
A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Commercial Forest Land
Productive forest land that is producing or capable of producing continuous crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Commercial Thinning
Thinning a stand where the trees to be removed are large enough to sell.

Commodity
Resources with monetary (market) or commercial value; all resource products which are articles of commerce, e.g., timber and minerals.

Corridor
Connective links of certain types of vegetation between patches of suitable habitat which are necessary for certain species to facilitate movement of individuals between patches of suitable habitat. Also refers to transportation or utility right-of-way.

Cover
Refers to trees, shrubs, or other landscape features that allow an animal to partly or fully conceal itself.

Critical Habitat
Specific terrain within the geographical area occupied by threatened or endangered species. Physical and biological features that are essential to conservation of the species and which may require special management considerations or protection are found in these areas.

Cruise
Refers to the general activity of determining timber volume and quality, as opposed to a specific method.

Cultural Resources
Historic or prehistoric objects, sites, buildings, structures, etc. that result from past human activities.

Cumulative Effects
The impacts on the environment resulting from the addition of the incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

Current Timber Supply
Timber specified by the Forest Service that has not been rejected by the purchaser and that has undergone analysis under the National Environmental Policy Act.

Cutover
Areas harvested recently.

Diameter at Breast Height
The diameter of a tree measured 4 feet 6 inches from the ground.

Debris Avalanche
The sudden movement downslope of the soil mantle; it occurs on steep slopes and is caused by the complete saturation of the soil from prolonged heavy rains.

Debris Flow
A general term for all types of rapid movement of debris downslope.

Debris Torrents
Landslides that occur as a result of debris; avalanche materials which either dam a channel temporarily or accumulate behind temporary obstructions such as logs and forest debris.

Deer Winter Range
Locations that provide food and shelter for Sitka black-tailed deer under moderately severe to severe winter conditions.

Degradation
The general lowering of the surface of the land by erosive processes, especially by the removal of material through erosion and transportation by flowing water.

Demographic
Pertaining to the study of the characteristics of human populations, such as size, growth, density, distribution, and vital statistics.

Developed Recreation
Recreation that requires facilities that, in turn, result in concentrated use of an area, such as campgrounds and ski areas. Facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings. See also Dispersed Recreation.

Direct Employment
The jobs that are immediately associated with the Long-Term Contract timber sale including for example logging sawmills and pulp mills.

Discounted Benefits
The sum of all benefits derived from the forest over the life of a project.

Discounted Costs
The sum of all costs incurred from the Project Area during the period of project implementation.

Dispersed Recreation
Recreational activities that are not confined to a specific place and are generally outside developed recreation sites. This includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross-country skiing, and recreation in primitive environments. See also Developed Recreation.

Doline
A relatively shallow bowl- or funnel-shaped depression ranging in diameter from a few to more than 3,000 feet. Also known as a sinkhole.

Down
A tree or portion of a tree that is dead and laying on the ground.

Draft Environmental Impact Statement
A statement of environmental effects for a major Federal action which is released to the public and other agencies for comment and review prior to a final management decision. Required by Section 102 of the National Environmental Policy Act (NEPA).

Duff
Vegetative material covering the mineral soils in forests, including the fresh litter and well decomposed organic material and humus.

Eagle Nest Tree Buffer Zone
A 330-foot radius around eagle nest trees established in a Memorandum of Understanding between the U.S. Fish and Wildlife Service and the Forest Service.

Effects
Effects, impacts, and consequences as used in this EIS are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social and may be direct, indirect, or cumulative.
Direct Effects—Results of an action occurring when and where the action takes place.
Indirect Effects—Results of an action occurring at a location other than where the action takes place and/or later is time, but in the reasonably foreseeable future.
Cumulative Effects—See Cumulative Effects

Encumbrance
A claim, lien, charge, or liability attached to and binding real property.

Endangered Species
A species of plant or animal which is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act. See also Threatened Species, Sensitive Species.

Endemic
Peculiar to a particular locality; indigenous.

Environmental Analysis
A comprehensive evaluation of alternative actions and their predictable short-term and long-term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. An EA is less comprehensive than an EIS, and may result in a Finding of No Significant Impact. Should the EA reveal significant impacts, a full EIS must then be conducted.

Erosion
The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities.

Escapement
Adult anadromous fish that escape from all causes of mortality (human-caused or natural) to return to streams to spawn.

Estuarine Fringe Habitat
A 1,000-foot zone around an estuary.

Estuary
For the purpose of this EIS process, estuary refers to the relatively flat intertidal and upland areas generally found at the heads of bays and mouths of streams. They are predominantly mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-Aged Management
Management that results in the creation of stands in which trees of essentially the same age grow together. Clearcut, shelterwood, and other tree-cutting methods produce even-aged stands. See also Uneven-aged Management.

Executive Order
An order issued by the President of the United States that has the force of law.

Existing Visual Condition (EVC)
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:
Type I: These areas appear to be untouched by human activities.
Type II: Areas in which changes in the landscape are not noticed by the average person unless pointed out.
Type III: Areas in which changes in the landscape are noticed by the average person but they do not attract attention. The natural appearance of the landscape still remains dominant.
Type IV: Areas in which changes in the landscape are easily noticed by the average person and may attract some attention. Although the change in landscape is noticeable it may resemble a natural disturbance.
Type V: Areas in which changes in the landscape are obvious to the average person. These changes appear to be major disturbances.
Type VI: Areas in which changes in the landscape are in glaring contrast to the natural landscape. The changes appear to be drastic disturbances.

Fen
A tract of low, marshy ground consisting of organic terrain, relatively rich in mineral salts. See also Muskeg.

Final Environmental Impact Statement (FEIS or Final EIS)
The final version of the statement of environmental effects required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the Draft EIS to include public and agency responses to the draft. The decisionmaker chooses which alternative to select from the Final EIS, and subsequently issues a Record of Decision (ROD).

Fine
Minute particles of soil.

Fiscal Year
The Federal Government's accounting period. October 1 through September 30; e.g., October 1, 1991 to September 30, 1992 = Fiscal Year 1992.

Fish Habitat
The aquatic environment and the immediately surrounding terrestrial environment that combined afford the necessary physical and biological support systems required by fish species during various life stages.

Fish Timing
A mitigation measure that restricts construction activities within an anadromous fish stream to minimize impacts on fish eggs, fry, and migrating salmonids. The normal period during which construction is permitted in fish streams is May 15 to August 20

Floodplain
The lowland and relatively flat areas joining inland and coastal waters including debris cones and flood-prone areas of offshore islands; including at a minimum that area subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year.

Fluvial
Of or pertaining to streams and rivers.

Forage
To wander or go in search of food.

Forb
Any herbaceous plant that is not a grass or grass-like. Includes plants that are commonly called weeds or wildflowers.

Foreground
The stand of trees immediately adjacent to a scenic area, recreation facility, or forest highway; the area located less than 1/4 mile from the viewer. See also Background and Middleground.

Forest or Forest System Land
National Forest lands currently supporting or capable of supporting forests at a density of 10 percent crown closure or better. Includes all areas with forest cover, including old growth and second growth, and both commercial and noncommercial forest land.

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA)
Amended in 1976 by the National Forest Management Act.

Forested Habitat
All areas with forest cover. Used in this EIS to represent a general habitat zone.

Forested Wetland
A wetland whose vegetation is characterized by an overstory of trees that are 20 feet or taller.

Forest Supervisor
The Forest Service officer responsible for administering a single national forest. The office of the Forest Supervisor for the Ketchikan Area of the Tongass National Forest is located in Ketchikan, Alaska.

Geographic Information System (GIS)
An information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision-making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps.

Glide Channel
Channel types that occur on lowlands and landforms and are mostly associated with bogs, marshes, or lakes.

Grabinski
A modified highlead cable logging system.

Groundwater
Water within the earth that supplies wells and springs.

Guidelines
A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives.

Habitat
The sum total of environmental conditions of a specific place that is occupied by an organism, population, or community of plants or animals.

Habitat Capability
The number of healthy animals that a habitat can sustain.

Haulout
An area of large, smooth rocks used by seals and sea lions for resting and pupping.

Humus
Substance of organic origin that is fairly but not entirely resistant to further bacterial decay.

IMPLAN
A computer-based system used by the Forest Service for constructing nonsurvey models to measure economic input. The system includes a database for all counties in the United States and a set of computer program to retrieve data and perform the computational tasks for input/output analysis.

Inclusions
Soil types that are not delineated on soil resource inventory maps because they are too small (in area) to be mapped at the scale used in the inventory at any locale.

Indicator Species
See Management Indicator Species

Indirect Employment
The jobs in service industries that are associated with the Long-Term Contract timber sale including for example suppliers of logging and milling equipment. See also Direct Employment.

Interdisciplinary Team (IDT)
A group of people with different backgrounds assembled to research, analyze, and write a project EIS. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze a proposed action and its alternatives.

Irretrievable Commitments
Loss of production or use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is allocated to a no-harvest prescription; if the allocation is changed to allow timber harvest, timber production can be resumed. The production lost is irretrievable, but not irreversible.

Irreversible Commitments
Decisions causing changes that cannot be reversed. For example, if a roadless area is allocated to allow timber harvest, and timber is actually harvested, that area cannot at a later time be allocated to wilderness. Once harvested, the ability of the area to meet wilderness criteria has been irreversibly lost. Often applies to nonrenewable resources such as minerals and cultural resources.

Issue
A point, matter, or section of public discussion of interest to be addressed or decided.

Karst
A type of typography that develops in areas underlain by soluble rocks, primarily limestones. Sinkholes, collapsed channels, vertical shafts, and caves are formed when the subsurface layer dissolves. Areas on which karst has developed area said to display "karst topography."

Knutsen-Vandenberg Act (KV)
An Act was passed by Congress in 1930 and amended in 1976 to provide for reforestation, resource protection, and improvement projects in timber sale areas from funds collected as a portion of the stumpage fee paid by the purchaser. Examples of such projects are stream bank stabilization, fish passage structures, and wildlife habitat improvement.

TLMP Land Use Designation (LUD)
The method of classifying land uses presented in the Tongass Land Management Plan (TLMP). Land uses and activities are grouped to define along with a set of coordinating policies a compatible combination of management activities. The following is a description of the four classifications in the current Forest Plan (TLMP 1979a, as amended):
LUD I: Wilderness areas.
LUD II: These lands are to be managed in a roadless state in order to retain their wildland character, but this designation would permit wildlife and fish habitat improvement as well as primitive recreation facility and road development under special authorization.
LUD III: These lands may be managed for a variety of uses. The emphasis is on managing for uses and activities in a compatible and complimentary manner to provide the greatest combination of benefits.
LUD IV: These lands provide opportunities for intensive resource use and development where the emphasis is primarily on commodity or market resources.

TLMP Draft Revision Land Use Designations (Existing in Project Area)
Beach Fringe and Estuary (BF)—Natural beach fringe and estuary habitats are managed to favor wildlife, fish, recreation, visual and other resources associated with beach fringe and estuary areas. Areas included are 500 feet from beaches and 1,000 feet from estuaries. These areas are managed in near-natural, undisturbed habitat conditions. Timber harvest is not allowed and cutting on the upland is discouraged; if allowed, it is limited to designated areas. Beach Fringe and Estuary areas are contained within other LUD's.
Stream and Lake Protection (Riparian Areas) (SL)—Under this LUD, areas comprised of aquatic and riparian ecosystems, including riparian streamsides, lakes, and floodplains, are designated for protection. These areas provide diverse habitat for upland- and riparian-associated species. Commercial timber harvest is prohibited within a minimum of 100 feet of all Class I streams and those Class II streams that flow directly into Class I streams. Roads are to be located outside of these areas to the extent practicable. Transportation developments should not impair the production and migration of anadromous fish. Stream and Lake Protection areas are contained within other LUD's.
Scenic Viewshed (SV)—These LUD's are managed to provide scenic landscapes, vistas, and travel corridors in areas viewed by the public mainly from roads, recreational sites, and waterways. Timber harvest is allowed as long as it complies with visual standards and guidelines. Roads and trails must be compatible with the natural landscape.
Modified Landscape (ML)—Modified Landscape LUD's provide a mix of management options, while minimizing the visibility of development activities. Timber harvest and road construction must be designed to retain visual quality and recreational opportunities.
Timber Production (TM)—The primary purpose of TM areas is to maintain and promote industrial wood production. Timber production activities will be designed to consider fish and wildlife habitat and recreational opportunities. Timber harvest may include both even- and uneven-aged silvicultural methods. The use of a specific silvicultural method will depend on the ecological characteristics of each stand and the stand location.
Experimental Forests (EF)—Experimental Forests (i.e., Maybeso Experimental Forest) provide a variety of long-term opportunities for forest research. Timber harvest and road construction is allowed for research and demonstration purposes.
Research Natural Area (RA)—These areas are managed for research and education and/or to maintain natural diversity on National Forest System lands. No timber harvest is permitted.

Large Woody Debris (LWD)
Any large piece of relatively stable woody material having a least diameter of greater than 10 centimeters and a length greater than one meter that intrudes into the stream channel.

Layout
Planning and mapping (using aerial photos) of harvest and road systems needed for total harvest of a given area.

Logging Systems
Highlead: A cable yarding system, using a two-drum yarder, in which lead blocks are hung on a spar or tower to provide lift to the front end of the logs.
Aerial Logging Systems: Systems where the cut logs are moved from the stump to the loading area or log deck without touching the ground.
Live Skyline/Gravity Carriage Return: A two-drum, live skyline yarding system in which the carriage moves down the skyline by gravity; thus, it is restricted tophill yarding. The skyline is lowered to attach logs then raised and pulled to the landing by the mainline.
Live Skyline/Haulback Required: A live skyline yarding system composed of skyline, main-line, and haulback; the carriage is pulled to the woods by the haulback; the skyline is lowered to permit the chokers to be attached to the carriage, and the turn is brought to the landing by the mainline.

Running Skyline: A yarding system with three suspended moving lines, generally referred to as the main, haulback, and slack-pulling, that when properly tensioned will provide lift, travel, and control to the carriage; normally indicates a gantry-type tower and a three-drum yarder.
Standing Skyline: Used wherever yarding distances or span distances exceed the capability of live skyline equipment.
Tractor: Used to describe the full range of surface-skidding equipment, designed to operate on level to downhill settings.
Shovel: A system of short-distance logging in which logs are moved from the stump to the landing by repeated swinging with a swing-boom log loader; the loader is walked off the haul road and out into the harvest unit; logs are moved and decked progressively closer to the haul road with each pass of the loader; when logs are finally decked at roadside, the same loader, or a different loader, loads out trucks. On gentle ground, logs are either heeled and swung or dragged by the boom as it rotates; larger log length and tree length logs are usually dragged to maintain machine stability. Soils should be moderate to well-drained and side slopes must be less than 20 percent; passes or stripes should be kept to a maximum of four.
Helicopter: Flight path cannot exceed 40 percent downhill or 30 percent uphill; landings must be selected so there is adequate room for the operation and so that the helicopter can make an upwind approach to the drop zone.
A-Frame: Beach fringe timber which is logged with a float-mounted yarder typically rigged in a highlead configuration for direct A-frame yarding.
Cold-deck and Swing: Planned to access areas not suitable for skyline operations.

Log Transfer Facility (LTF)
A facility that is used for transferring commercially harvested logs to and from a vessel or log raft or the formation of a log raft. It is wholly or partially constructed in waters of the United States and siting and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed "terminal transfer facility."

Management Area
An area one or more VCU's in size for which management direction was written in the Tongass Land Management Plan.

Management Indicator Species (MIS)
Species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management. The following categories were used where appropriate: endangered and threatened plant and animal species identified on State and Federal lists; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; additional plant or animal selected because their population changes are believed to indicate effects of management activities on other species of a major biological community or on water quality.

Management Prescriptions
Method of classifying land uses presented in the Tongass Land Management Plan (TLMP) Revision Draft EIS. Replaces the Land Use Designations (LUD's) presented in TLMP, as revised.

Marginal
Commercial forest land (CFL) areas that do not qualify as standard or special CFL since they are not operable under short-term (ten years or less) projections of accessibility and economic conditions.

Mass Failure
The downslope movement of a block or mass of soil. This usually occurs under conditions of high-soil moisture and does not include individual soil particles displaced as surface erosion.

Mass Wasting
A general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another. Also known as mass movement.

McGilvery
Soil type which represents the only well-drained organic soil found in the Ketchikan Area. It is composed of a thin layer (less than 8 inches deep) of organic duff overlying bedrock or boulders, generally occupying the upper backslopes of hills and mountains. These soils are associated with cliffs and rock outcrops, and are sensitive to disturbance.

Mid-market Analysis
The value and produce mix represented at the quarter in which the pond log value (end-product selling price less manufacturing cost) for the species and product mix most closely matches the point between the ranked quarters of the Alaska Index Operation pond log value, adjusted to Common Year Dollars, where one half of the harvest of timber from the Tongass National Forest has been removed at higher values and one half of the timber has been removed at lower values during the period from 1979 to the current quarter (FSH 2409.22 R10 Chapter 531.1-2).

Mineral Soils
Soils consisting predominantly of, and having is properties determined by, mineral matter.

Mitigation
Measures designed to counteract environmental impacts or to make impacts less severe. These measures may include avoiding an impact by not taking a certain action or part of an action, minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during he life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

Model
A representation of reality used to describe, analyze, or understand a particular concept. A model may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. A model has limits to its effectiveness and is used as one of several tools to analyze a problem.

Monitoring
A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring can occur at different levels: to confirm whether mitigation measures were carried out in the matter called for (Implementation Monitoring); to confirm whether mitigation measures were effective (Effectiveness Monitoring); or, to validate whether overall goals and objectives were appropriate (Validation Monitoring). Different levels call for different methods of monitoring.

Multi-Entry Layout Plan (MELP)
Interdisciplinary design and mapping of all potential timber harvest units, including associated logging and transportation systems, within a project area.

Muskeg
In Southeast Alaska, a type of bog or fen that has developed over thousands of years in depressions or flat areas on gentle to steep slopes. Also called peatlands.

Natal Streams
Home stream where an anadromous fish is hatched.

National Environmental Policy Act (NEPA)
An act, passed by Congress in 1969, that declared a national policy to encourage productive harmony between humans and their environment to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of humans to enrich the understanding of the ecological systems and natural resources important to the nation and to establish a Council on Environmental Quality. This act requires the preparation of environmental impact statements for federal actions that are determined to be of major significance.

National Forest Management Act (NFMA)
A law passed in 1976 that amends the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Forest plans, Regional guides, and regulations to guide that development.

Native Allotment
At tract of non-mineral land, not to exceed 160 acres, on which an Alaska Native (who was 21 years of age or head of a household) established continuous use and occupancy prior to the creation of the National Forests (authorized under the Native Allotment Act of May 17, 1906).

Native Selection
Application by Native corporations and individuals to a portion of the Bureau of Land Management for conveyance of lands withdrawn in fulfillment of Native entitlements established under ANCSA.

Net Sawlog Volume
Trees suitable in size and quality for producing logs that can be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

No-action Alternative
The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Noncommercial Forest Land
Land with more than 10 percent cover of commercial forest tree species but not qualifying as commercial forest land (CFL).

Notice of Intent (NOI)
A notice printed in the Federal Register announcing that an EIS will be prepared. The NOI must describe the proposed action and possible alternatives, describe the agency's proposed scoping process, and provide a contact person for further information. The NOI for this project was submitted on March 1, 1990.

Offering
A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a contract.

Offering Area
A geographic area identified by the Forest Service within which the offering specifications are outlined. One or more offering areas may be identified within all or a portion of a project area.

Off-highway Vehicle (OHV)
Any vehicle that is restricted by law from operating on public roads for general motor vehicle traffic. Includes motorbikes, minibikes, trailbikes, snowmobiles, dunebuggies, all-terrain vehicles, and four-wheel drive, high clearance vehicles (FSM 2355.01). Sometimes referred to as Off-road vehicle or ORV.

Old-Growth Forest
A forest stand characterized by trees well past the age of maturity (dominant trees exceed 300 years in age). Stands exhibit declining growth rates and signs of decadence such as dead and dying trees snags and downed woody material. Stands include trees of all ages, multilayered canopies, a range of tree diameter sizes (including very large diameter trees up to and exceeding 3 meters), and the notable presence of understory vegetation. Old growth forests provide important habitat for Sitka black-tailed deer, marten, black bears, cavity-nesting birds, raptors, and other wildlife species.

Overmature
The stage at which a tree declines in vigor and soundness, for example, past the period of rapid height growth.

Overstory
The portion of trees in a forest that forms the uppermost layer of foliage, usually formed by the tallest trees. Also called the canopy.

Partial Cut
Method of harvesting trees (not clearcutting) where any number of live stems are left standing in any of various spatial patterns. Can include seed tree, shelterwood, or other methods.

Peak Flow
The highest discharge of water recorded over a specified period of time at a given stream location.

pH
The degree of acidity or alkalinity.

Planning Record
A detailed, formal account of the planning process for an EIS. The record contains data, maps, reports, planning process information, and results of public participation in the planning process. The Planning Record documents the decisions and activities that resulted in the Final EIS. Planning records are available for public review upon request under the Freedom of Information Act.

Pond Value
The delivered price of logs at the mill minus the cost to manufacture them into usable products.

Precommercial Thinning
The practice of removing some of the trees of less than marketable size from a stand in order to achieve various management objectives.

Present Net Value
The difference between benefits and costs associated with the alternatives.

Proportionality
Section 301(c)(3) of the Tongass Timber Reform Act requires that harvest of high volume old-growth (volume classes 6 and 7) will not be at an accelerated rate. The Act requires that the proportion of harvest in volume classes 6 and 7 will not exceed the proportion of volume of these classes currently represented in a contiguous management area.

Record of Decision (ROD)
A document separate from but associated with an EIS that states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternatives have been adopted, and if not, why not.

Recreation Opportunity Spectrum (ROS)
The system for planning and managing recreation resources that categorizes recreation opportunities into six classes. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skill needed to enjoy the area, and the relative density of recreation use. The classes are:
Primitive: An essentially unmodified natural environment of fairly large size. Interaction between users is very low, and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use is generally not permitted.
Semi-Primitive Nonmotorized: A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed to minimize onsite controls and restrictions. Use of local roads for recreational purposes is not allowed.
Semi-Primitive Motorized: A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed to minimize onsite controls and restrictions. Local roads used for other resource management activities may be present.
Roaded Natural: A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.
Roaded Modified: A natural environment that has been substantially modified particularly by vegetation manipulation. There is strong evidence of roads and/or highways. Frequency of contact is low to moderate.
Rural: A natural environment that has been substantially modified by development of structures and vegetative manipulation. Structures are readily apparent and may range from scattered to small dominant clusters. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high.

Reforestation
The natural or artificial restocking of an area with trees.

Regeneration
The process of establishing a new crop of trees on previously harvested land.

Region
An area covered by a Forest Service regional guide. A region is generally composed of one or more national forests. Forest Service Region 10 includes the Tongass National Forest and the Chugach National Forest.

Regional Forester
The Forest Service official responsible for administering a single region.

Regional Guide
The guide developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended. It guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands within a given report.

Research Natural Area (RNA)
An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community primarily for scientific and educational purposes. In Forest Service usage, RNA's are areas designated to ensure representative samples of as many major naturally occurring plant communities as possible.

Reserved
Lands that have been withdrawn from the timber base by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

Resident Fish
Fish that are not anadromous and that reside in fresh water on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Riparian Area
Transition zone between a stream or lake system and the adjacent land. Identified in part by soil characteristics or distinctive plant communities that require free or unbound water.

Road Maintenance Level
The level of service provided by, and maintenance required for, a specific road consistent with road management objectives and maintenance criteria (FSH 7709.58, Section 12.3).
Maintenance Level 1: Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period is one year or longer. Basic custodial maintenance is performed.
Maintenance Level 2: Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration.
Maintenance Level 3: Assigned to roads open and maintained for travel by the prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.
Maintenance Level 4: Assigned to roads that provide a moderate degree to user comfort and convenience at moderate travel speeds.
Maintenance Level 5: Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-laned and paved, or aggregate surfaced with dust abatement.

Road Management Objective (RMO)
Defines the intended purpose of an individual road based on Management Area direction and access management objectives. Road management objectives contain design criteria, operation criteria and maintenance criteria. Long-term and short-term roads have RMO's.

Roads
Arterial: Developed an operated for long-term land and resource management purposes to constant service.
Collector: Collects traffic from Forest local roads; usually connects to a Forest arterial or public highway.
Local: Provides access for a specific resource use activity such as a timber sale or recreational site, although other minor uses may be served.
Preplanned: Roads planned in a prior EIS.
Temporary: For National Forest timber sales temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the permanent forest transportation network and have stream crossing structures removed erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Roadless Area
An area of undeveloped public land identified in the roadless area inventory of the TLMP Draft Revision within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Rotation
The planned number of years (approximately 100 years in Alaska) between the time that a Forest stand is regenerated and its next cutting at a specified stage of maturity.

Salvage Sale
A timber sale to use dead and downed timber and scattered poor-risk trees that would not be marketable if left in the stand until the next scheduled harvest.

Sawlog
That portion of a tree that is suitable in size and quality for the production of dimension lumber, collectively known as sawtimber.

Scheduled Timber Harvests
Timber harvests done as part of meeting the allowable sale quantity.

Scoping Process
Early and open activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data is needed, and what level of public participation is appropriate. Scoping focuses on the issues surrounding the proposed action and the range of actions, alternatives, and impacts to be considered in an EA or an EIS.

Second-growth Forest
Forest growth that has become established following some disturbance such as cutting serious fire, or insect attack; even-aged stands that will grow back on a site after removal of the previous timber stand.

Seedling/Sapling Stage
The stage following timber harvest when most of the colonizing tree and shrub seedlings become established. Usually 1 to 25 years.

Selection Cutting
The annual or periodic removal or trees (particularly mature trees), individually or in small groups from an uneven-aged forest to realize the yield and establish a new crop of irregular constitution.

Sensitive Species
Plant and animal species which are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on a nonofficial State list, or that are recognized by the regional forester as needing special management on national forest lands to prevent placement on Federal or state lists.

Sensitivity Level
The measure of people's concern for the scenic quality of the National Forests. In 1980 the Tongass National Forest assigned sensitivity levels to land areas viewed from boat routes and anchorages, plane routes, roads trails, public use areas, and recreation cabins.
Level I: Includes all seen areas from primary travel routes use areas and water bodies where at least three-fourths of the forest visitors have a major concern for scenic quality .
Level II: Includes all seen areas from primary travel routes, use areas, and water bodies where at least one-fourth of the forest visitors have a major concern for scenic quality.
Level III: Includes all seen areas from secondary travel routes, use areas, and water bodies where less than one-fourth of the forest visitors have a major concern for scenic quality .

Shelterwood Cutting
A harvest method in which most of the trees are removed in an initial entry and some trees are left to naturally reseed the area and provide protection to new seedlings that establish on a site. A second entry is conducted later to remove the remaining trees.

Significant
Specific legal term under the National Environmental Policy Act that requires considerations of both context and intensity in evaluating impacts.

Silviculture
The science of controlling the establishment, composition, and growth of forests.

Slash
Debris left over after a logging operation i.e., limbs, bark, broken pieces of logs.

Smolt
Young salmon or trout that move from freshwater streams to saltwater.

Snag
A standing dead tree, usually greater than 5 feet tall and 6 inches in diameter at breast height.

Soil Productivity
Capacity of soil to produce plant growth due to the soil's chemical, physical, and biological properties.

Soil Texture
Relative amounts of sand, silt, and clay in a soil. Coarse-textured soils are generally considered sandy and often contain gravel of various sizes. Fine-textured soils are considered very fine, sandy, silty, or clayey.

Stand (Tree Stand)
A group of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

Standard
A course of action or level of attainment required by the Forest Plan to promote achievement of goals and objectives.

State Historic Preservation Officer (SHPO)
State appointed official who administers Federal and State programs for cultural resources.

State Selection
Application by Alaska Department of Natural Resources to the Bureau of Land Management for conveyance of a portion of the 400,000-acre State entitlement from vacant and unappropriated National Forest System lands in Alaska under the Alaska Statehood Act.

Stream Classes
See Aquatic Habitat Management Unit

Structural Diversity
The diversity of forest structure, both vertically and horizontally, which provides for variety of forest habitats such as logs and multi-layered forest canopy for plants and animals.

Stumpage
The value of timber as it stands uncut in terms of dollar value per thousand board feet.

Subsistence Use
The customary and traditional uses by rural Alaskan residents of wild renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter or sharing, for personal or family consumption; and for customary trade.

Subsistence Use Area
Important Subsistence Use Areas include the "most reliable" and "most often hunted" categories from the Tongass Resource Use Cooperative Survey (TRUCS) and from subsistence survey data from ADF&G, the University of Alaska, and the Forest Service-Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

Substantive Comment
A public comment that provides factual information, professional opinion, or informed judgment germane to the action being proposed.

Succession
The ecological progression of community change over time, characterized by displacements of species leading to a relatively stable climax community.

Suitable
Commercial forest land identified as having both the biological capability and availability to produce industrial wood products.

Sustained Yield
The amount of renewable resources that can be produced continuously at a given intensity of management.

Temporary Roads
See Roads

Tentatively Suitable Forest Land
Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary of Agriculture or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Thousand Board Foot Measure (MBF)
A method of timber measurement equivalent to 1000 square feet of lumber one inch thick.

Threatened Species
A species of plant or animal likely to become endangered within the foreseeable future throughout all or a significant portion of its range, as defined in the Endangered Species Act of 1973, and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species. (See also Endangered Species and Sensitive Species.)

Tiering
Eliminating repetitive discussion of the same issue by incorporating by reference. The general discussion in an EIS of broader scope; e.g., this document is tiered to TLMP, as amended.

Timber Appraisal
Establishing the fair market value of timber by taking the selling value minus manufacturing costs, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Timber Entry
A term used to refer to how far into the timber rotation an area is on the basis of acreage harvested. For example, if an area is being managed for 3 entries over a 100-year rotation, the first entry would be completed when one-third (approximately 33 percent) of the available acreage is harvested (usually in 30-40 years); the second entry would be completed when two-thirds (approximately 66 percent) of the available acreage is harvested (usually 60-70 years); the third entry would be completed when all of the available acreage is harvested (at the end of the rotation).

Timber Production
The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use.

Timber Sale Contract
Refers to the KPC Long-Term Timber Sale Contract with the Forest Service.

Tongass Land Management Plan (TLMP)
The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning and the daily uses and activities carried out within the forest.

Tongass Resource Use Cooperative Survey (TRUCS)
A compilation of data on subsistence uses for evaluating the effects of the proposed action in this EIS.

Turbidity
An indicator of the amount of suspended sediments in water.

Understory
The trees and shrubs in a forest growing under the main crown canopy or overstory.

Uneven-Aged Management
The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular size to retain within each area, thereby maintaining a planned distribution of size classes.

Unsuitable
Forest land withdrawn from timber utilization by statute or administrative regulation (e.g., wilderness), or identified as not appropriate for timber production in the forest planning process.

Utility Logs
Those logs that do not meet sawlog grade but are suitable for production of firm usable pulp chips.

Value Comparison Unit (VCU)
Areas which generally encompass a drainage basin containing one or more large stream systems; boundaries usually follow easily recognizable watershed divides. Established to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Viable Population
The number of individuals in a species required to ensure the continued long-term existence of the population in natural, self-sustaining populations and adequately distributed throughout the region.

Viewshed
An expansive landscape or panoramic vista seen from a road, marine waterway, or specific viewpoint.

Visual Quality Objective (VQO)
Measurable standards reflecting five different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The five categories of VQO's are:
Preservation: Permits ecological changes only. Applies to wilderness areas and other special classified areas.
Retention: Provides for management activities that are not visually evident; requires reduction of contrast through mitigation measures either during or immediately after operation.
Partial Retention: Management activities remain visually subordinate to the natural landscape. Mitigation measures should be accomplished within one year of project completion.
Modification: Management activities may visually dominate the characteristics landscape. However activities must borrow from naturally established form line color and texture so that its visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.
Maximum Modification: Management activities may dominate the landscape. Mitigation measures should be accomplished within five years of project completion.

Volume
Stand volume based on standing net board feet per acre by Scribner Rule.

Volume Class
Used to describe the average volume of timber per acre in thousands of board feet (MBF). The seven volume classes include:
Classes 1 to 3: Less than 8 MBF/acre (cleared land seedlings or pole timber stands).
Class 4: 8 to 20 MBF/acre.
Class 5: 20 to 30 MBF/acre.
Class 6: 30 to 50 MBF/acre.
Class 7: 50+ MBF/acre.

V-notch
A deeply cut valley along some waterways, generally in steep, mountainous terrain, that would look like a "V" from a frontal view.

Watershed
That area that contributes water to a drainage or stream; portion of a forest in which all surface water drains to a common point. Can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Wetland
Areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds.

Wilderness
Areas designated under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions. In Alaska, wilderness also has been designated by TTRA and ANILCA.

Wildlife Analysis Area (WAA)
Alaska Department of Fish and Game administrative designation of an area that includes one or several Value Comparison Units (VCU's) for wildlife analysis and regulating wildlife populations.

Wildlife Habitat
The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Wildlife Habitat Management Unit (WHMU)
An area of wildlife habitat identified during the IDT process as having values important to wildlife.

Windfirm
Configuration of harvest units so as not to create an opening which exposes the adjacent stand of timber to the direction of the major prevailing storm wind (southeast).

Windthrow
The act of trees being uprooted, blown down, or broken off by storm winds. Three types of windthrow include: endemic where individual trees are blown over, catastrophic where a major windstorm can destroy hundreds of acres, and management related where the clearing of trees in an area makes the adjacent standing trees vulnerable to windthrow.

Winter Range
An area, usually at lower elevation, used by big game during the winter months.

Withdrawal
The withholding of an area of Federal land from settlement, sale, location, or entry under some or all of the general land laws of the purposes of limiting activities under those laws to maintain other public values in the area.

Yarding
Hauling timber from the stump to a collection point.

Yield Tables
Tables that estimate the level of outputs that would result from implementing a particular activity. Usually referred to in conjunction with FORPLAN input or output. Yield tables can be developed for timber volumes, range production, soil and water outputs, and other resources.

Chapter 7

Distribution List

Chapter 7

Distribution List

List of Agencies, Organizations, and Persons to Whom Copies of this Draft Environmental Impact Statement Were Sent. An additional 76 individuals requested a summary only.

Agencies

Advisory Council on Historic Preservation
Alaska Department of Community & Regional Affairs, Commissioner
Alaska Department of Community & Regional Affairs, Supervisor
Alaska Department of Commerce & Economic Development, Commissioner
Alaska Department of Commerce & Economic Development, Economic Development Division
Alaska Department of Environmental Conservation
Alaska Department of Environmental Conservation, Director, Environmental Quality Division
Alaska Department of Environmental Conservation, Public Information Office
Alaska Department of Environmental Conservation, SE Regional Manager
Alaska Department of Fish & Game
Alaska Department of Fish & Game, Commercial Fish Management
Alaska Department of Fish & Game, Commercial Fisheries Division
Alaska Department of Fish & Game, FRED Division
Alaska Department of Fish & Game, Director, FRED Division
Alaska Department of Fish & Game, FRED, Klawock Hatchery
Alaska Department of Fish & Game, Division of Wildlife Conservation
Alaska Department of Fish & Game, Division of Habitat
Alaska Department of Fish & Game, Division of Sport Fish
Alaska Department of Fish & Game, Division of Subsistence
Alaska Department of Fish & Game, Herring Research
Alaska Department of Fish & Game, Office of Commissioner
Alaska Department of Natural Resources, Division of Forestry
Alaska Department of Natural Resources, Division of Parks & Outdoor Recreation
Alaska Department of Natural Resources, Division of Land
Alaska Department of Natural Resources, Office of Commissioner
Alaska Department of Natural Resources, State Historic Preservation Office
Alaska Department of Transportation and Public Facilities, Maintenance Station
Alaska Energy Authority
Alaska Legal Information Office
Army Corps of Engineers
Citizens Advisory Commission, Federal Areas, Executive Director
Mt. Baker/Snoqualmie National Forest
National Marine Fisheries Service
National Oceanic and Atmospheric Association
SE Native Subsistence Commission, President

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SE Native Subsistence Commission
U.S. Department of Agriculture, Forest Service
U.S. Department of Transportation, Environmental Division
U.S. Environmental Protection Agency
U.S. Fish & Wildlife Service
U.S. Fish & Wildlife Service, Ecological Services
U.S. Fish & Wildlife Service, Field Supervisor

Libraries

Alaska Department of Environmental Conservation Library
Alaska Resource Library
Alaska State Library
Colorado State University Libraries
Craig Public Library
Hollis Community Library
Ketchikan Public Library
Ketchikan Community College
National Agriculture USDA Coordinator
University of Alaska Library
U.S.D.A. Forest Service, Regional Office, Library

Media

Island News
Ketchikan Daily News
KFSK
KINY/KSUP Radio
KJNO 630/FM 105 Alaska Radio
KRBD (FM)
KRSA (AM)
KSTK (FM)
KT00 FM Radio & TV
KTKN (AM) / KGTW (FM)
Petersburg Pilot
SE Alaska Business Journal
Wrangell Sentinel

Organizations

Air Marine Company
Alaska Forest Association, Government Affairs Office
Alaska League of Women Voters
Alaska Miners Association
Alaska Native Council
Alaska Native Sisterhood
Alaska Women in Timber
Alaska Timber Corporation
Alaska Forest Association
Alaskans for Responsible Resource Management
AP&T
All Native Council
Alaska Pulp Company
Bishop Log Salvage
Bruce Hill School (c/o L&L Logging)
Byron Bros. Cutting
Campbell Towing Company
Center for Urban Affairs, Northwestern University

Chatham Logging & Lumber
Citizen's Advisory Committee on Federal Areas
Cooke Cablevision Inc.
Craig F&G Committee
Dames & Moore
David Evans and Assoc.
E.C. Phillips & Sons
Gildersleeve Logging
Gillnetters Association
Good Wood Productions
Greater Gila Biodiversity Project
Greenpeace
Haida Corporation
Haida Society
Hyak Charters
HyAlaska Charters
J&M Salvage
K'ayk'aanii Xaat'aay Tribal Council
Ketchikan Marine Charters
Ketchikan Ministerial Association
Ketchikan Pulp Company
Ketchikan Pulp Company, Timber Division Manager
Ketchikan Pulp Company, Contract Supervisor
Ketchikan Youth Services
Klawock Cooperative Association
Klawock Elementary School
Klukwan Forest Products, Inc.
Klukwan, Inc.
Landau Associates, Inc.
Law Office of Tom Even
Leslie Cutting Inc.
National Parks & Conservation Association
NOLS Alaska
Perry L. Goichoechea Trucking
Petersburg Chamber of Commerce
Petersburg Indian Association
POW Conservation League
Reed Bros. Logging & Construction
Revilla High School
Schmolck Mechanical Contractors
SE Alaska Conservation Council
SE Alaska Seiners
SE Cedar Products
Sierra Club Legal Defense Fund
Society of American Foresters
Tongass Conservation Society
Tongass Sportfishing Association
United SE Alaska Gillnetters, Ketchikan Local
University of Alaska (SE)
Whale Pass Homeowners Association
Wilks Logging
W. R. Jones & Son Lumber Company
Wrangell Resource Council

7 Distribution List

Public Officials

State Senator Sam Cotten
State Senator Dick Eliason
State Representative Carroll Fader
State Senator Rick Halford
State Representative Bill Hudson
State Representative Jerry Mackie
State Representative Bill Williams
Aide to US Senate/House of Reps Sherrie Slick
State Senator Robin Taylor
State Representative Fran Ulmer
Alabama State Senator Frank Ellis
City of Craig
City of Hydaburg
City of Kasaan
City of Klawock, Planning Director, Marilyn Westfall
City of Thorne Bay, Mayor, David Berkey
City of Thorne Bay, City Administrator, Ginney Tierney
Hollis Community Council, John Laird
House of Representatives, Donald Young
Office of Governor, Juneau
U.S. Senator Frank Murkowski
U.S. Senator Ted Stevens

Individuals

Acton, Steven D.
Adams, Farrell Steve
Allred, Kevin
Anderson, Annettte
Anderson, David
Andrew, Kay
Andrew, Richard
Anglin, Gregory
Armstrong, T. A.
Athorp, Mr. & Mrs.
Baggere, Anna D.
Baker, Rowan
Bandy, Garrett
Barlow, Gary
Barrett, Vera L.
Barron, Linda
Beebe, Rocky D.
Belk, Barney
Belk, Gary
Benner, Clayton R.
Bennett, Fred
Berkey, David M.
Bethel, Mitchell D.
Bethel, Patrick R.
Betzina, Sue
Bevis, John
Bigelow, Mrs. L.C.
Booth, Robert H.
Brakel, Judy
Brame Jr., James
Briggs, Tom
Brown, Gary
Burdett, Betsey
Burgess, Victor
Buss, Wesley G.
Butler, Jack
Canas, George
Carle, Arlene
Carns, George
Cebula, Jacob
Chambers, Ed
Charles, Melvin J.
Chatham, Jo
Chrisman, Grant A.
Clough, Helen
Coats, Gary
Coburn, Della
Connelly, Steve
Cook, Bruce
Cowan, Raymond D. & Georgia
Craig, Tom
Crumpton, Debbie L.
Dale, Ralph S.
Davis, Gerri
DeMars, Janet
Domenowske, Susan
Douville, Cliff
Douville, Mike
Dukete, Jacqueline M.
Durette, Corey

Echols, Pam
Elliot, Robert B.
Emmons, Glen D.
Emmorey Sr., Clayton R.
Engel, Eugene
Erickson, Richard
Escoffon, Michael
Estofin, Skip
Finney, Don L.
Flynn, Kurt
Freedman, Barny
Friese, Rolin
Frisby, David
Fritzke, Mark
Funk, Kent
Gabriel, John P.
Gavette, David
Gildersleeve, Richard
Gray, Paul
Gregg, Douglas
Gregory, L.
Griffin, Mr. & Mrs. Frank J.
Groshong, Ralph
Grosshardt, Vivian L.
Guest, Robert & Carrol
Haddix, Mike
Hammons, Ken
Harp, Daniel J.
Harrington, Skip & Wilma
Harris, Arthur Lee
Harris, Greg
Harrison, Nancy
Hastings, Ben
Heady, Christine
Heath, Charlanne J.
Hendricks, Charles & Kay
Hendrickson, Wayne D.
Henerson, Dale
Hermanns, Jeff
Hines, Roy & Carol
Howey, Mark & Suzanne
Hull, Margaret M.
Isaacs, Patrick & Janice
Isley, Elzie
James, Bert
Jenson, J.E.
Johnson, John
Johnson, Roger
Johnson, Ted
Karthals, Kurt
Kelly, Lynn
Kelly, Morgan & Yolanda
Kero, James J. & Derinda
Kilanowski, Jerry
Klein-Enright, Chere
Knotts, Robert & Libby
Knudsen, Timothy D.
Kolkow, Joe D.
Kouni, Michael
Kuenigs, Don
Laird, John
Laird, Johnni
LaPerriere, Marcel
Le Cornu, Adrian & Vicki
Lehman, Dale
Lewis, Steve
Llanos, James
Lockhart, Chuck
Loitz, Dan B.
Long, Brayton E.
Love, David
Luhr, Jason R.
Mackie, Jim
Malone, Lana
Mann, Susan Elaine
Martinez, Jim
Marzden, Stan
Mays, James R.
McCarroll, Richard
McClelland, David
Meredith, Steve
Meske, Sandra J.
Mestas, Jan
Miller, Lynn R.
Miller, Rena L.
Miller, Sue
Mills, Tom
Milner, Scott
Mooney III, Mr. & Mrs. H.R.
Morris, John
Morris, Mary A.
Murphy, Steve
Myren, Dick
Natcong, Chuck
Nelson, Gordon O.
Nelson, Hyrum
Nelson, Lester
Netling, Kim
Newport, Daniel M.
Nickerson, Don
Nickerson, Jeff
Niles, Steve
Normand, Arthur
Nugent, Sue
Oetken, E.R.
Owens, Dave

7 Distribution List

Paden, Ronald
Palmisano, John J.
Paulsen, Bruce
Peratrovich, Dubs & Clara
Peterson, Al
Peterson, Paula
Pieper, Paul
Pihl, Martin R. & A. Darlene
Pool, Rollo W.
Preston, Erin L.
Randrup, Joel
Reinhart, Troy
Rieves, Mike & Cindy
Robb, Richard S.
Robertson, Monagle & Eastaugh
Robinson, L. Scott
Romine, Bruce A.
Rommen, John
Sallee, Mike
Sallup, Paul & Ronda
Sanders, Sue
Schmitt, Terry A.
See, Jim & Kathy
Shapley, Fred
Sharp, Dan
Shuham, Walter
Silberling, Helen
Simmons, Patrick
Sinclair, Duane
Singer Jr., William R.
Smith, Darrell D.
Smith, Frank
Smith, Pete
Soderberg, Gary D.
Sondenda, Leroy
Stafford, Ladonna J.
Stallings, Shelley
Starkweather, Cathy
Stecklein, Joseph V.
Storie, Mr. & Mrs. John
Sund, Werner
Tanino, Ray
Taylor, Dan
Taylor, Steve & Carole
Thomas, Jody
Thompson, John
Thompson, Louis
Thornlow, Don
Tierney, Pat & Ginny
Turner, Kiley J.
Tuttle, Jim
Twitchell, Tom
Tyrell, William
Urbania, John
Walker, Dave
Walker, Rocky
Ward-Taremi, Linda
Warner Jr., Earl
Wasserman, Harry
Weller, Jan
Wetherbee, Frank
Whitten, Jr, Mr. & Mrs. Billy
Williams, Dan
Williams, Mary
Williams, Ron
Willis, Joe
Wolfe, Dennis
Wollgast, Terry & Kathy
Woods, Bill
Woolley, Dan
Wylie, Nickolas
Yoder, Marvin
Yonker, Gordon
Young, Karen

Chapter 8

Preparers

Chapter 8

List of Preparers

***Randal L. Fairbanks**, Project Manager
M.S., Forest Resources Wildlife Science and Biostatistics, University of Washington, 1979
B.S., Forest Resources Wildlife Science, 1972

Foster Wheeler Environmental: 18 years   Other: 3 years

Twenty-one years experience in the design, coordination, and management of comprehensive environmental monitoring programs, ecological research and inventories, impact assessments, and mitigation plans. Key contributor or project manager for more than 10 major EIS/EA efforts, half of which were completed for the Forest Service. Resided in Anchorage for 4 years where he managed wildlife studies for several Alaska-based environmental projects in southeast and south-central Alaska. Also participated in studies on the North Slope, in the Chukchi Sea, Bering Sea, and Aleutian Islands.

Mark Greenig, Landscape Resource Planner, Recreation Resources Team Leader

M.U.P., Urban Planning, Texas A&M University, 1985
B.S., Landscape Architecture, California Polytechnic State University, 1978

Foster Wheeler Environmental: 4   Other: 11

Fifteen years of experience in planning, evaluating, designing, and managing projects in the built and natural environment. Work includes environmental impact assessment, recreation planning, recreation facility design, visual resource analysis, site planning, landscape design, real estate development, and tourism planning.

Amichay Greenstein, Economist/Planner

M.A., Development Economics, The American University, Washington D.C., 1991
B.S., Business Administration/Accounting, The American University, 1989

Foster Wheeler Environmental: 4   Other: 2

Six years of experience in socioeconomic impact and economic feasibility analysis of environmental, construction, and maintenance projects. Directly responsible for the methodological analysis of local and regional economic and social impacts on population, employment, housing, and communal services as well as assessment of project economic and financial viability.

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* ID Team Member

8 List of Preparers

Scott Hamlow, Technical Editor/Writer

B.S., Technical Communication, University of Washington, 1993

Foster Wheeler Environmental: 3

Three years of experience in technical editing, document production, and graphics design. Has assisted with editing/writing of large interdisciplinary EIS's and engineering documents and served as lead editor/writer on several environmental technical reports.

Donna Hawley, Cartographer, GIS Technical Coordinator

B.S. Cartography, Salem State College, 1988

Foster Wheeler Environmental: 2 Other: 4

Six years of experience in design and development of complex geo-spatial databases and analysis. Extensive experience with ARC/INFO and ARC Macro Language (AML), and knowledgeable in several related mapping applications. Coordinates and schedules GIS project work for Foster Wheeler Environmental, including supervision and direction of staff GIS and CAD specialists.

John Knutzen, Fisheries Biologist

M.S., Fisheries, University of Washington, 1977
B.A., Biology, Western Washington State College, 1972

Foster Wheeler Environmental: 17 Other: 2

Nineteen years of experience in assessing impacts to fisheries resources and developing mitigation and enhancement plans for fisheries resources. Work includes designing habitat enhancement structures and coordinating improvements of rearing habitat for resident trout and anadromous fish; assessing the effects of fine sediment runoff into salmon spawning streams; managing or assisting in instream flow studies for small and large streams; and assessing the effects of flow and sediment composition on quantity and quality of spawning habitat.

***John E. (Jack) Lobdell, Ph.D.,** Cultural Resources Specialist, Cultural Resources Team Leader

Ph.D., University of Tennessee
M.A., University of Wyoming
B.A., University of New Mexico

Lobdell & Associates: 16 Other: 19 (some concurrently with Lobdell & Associates)

Specialist in earth and environmental sciences, historical and cultural resources, microcomputer applications in the sciences, technical photography, management consulting. University professor (University of Alaska) for 14 years.

***Larry Lunde,** Forest Service Team Leader (Contracting Officer's Representative [COR])

B.S., Forest Management, Washington State University, 1973

Forest Service: 20

Previous experience in forest and multiple-use management positions as District Resource Staff and District Ranger on: Nez Perce National Forest in Idaho, El Dorado National Forest in California, Gifford Pinchot National Forest in Washington, Mount Hood and Fremont National Forests in Oregon.

***Mary McGown**, Landscape Architect, Visual Resources Team Leader

Ph.D. (Candidate), Wildlife and Range Sciences in the Forest Social Sciences, University of Idaho, College of Forestry
M.L.A., Landscape Architecture, University of Colorado
B.A., Biology, University of Northern Colorado

Beck & Baird: 10 Other: 2
More than 10 years experience in visual resource management, recreation planning, and environmental studies. Contributed to a number of EIS's and EA's. Project work includes visual and recreation resource assessments for proposed mines in central Idaho and Southeast Alaska, and recreation assessments of 8 rivers for the Idaho Department of Parks and Recreation.

***Jim Mehrwein,** Forester, Forestry Team Leader

B.S., Forest Management, Northern Arizona University

Mason, Bruce & Girard, Inc.: 11 Other: 11
Twenty years of experience in timber harvest plan layout, logging administration, selection of proper logging methods and silvicultural systems. Project responsibilities have included cruise marketing, appraisal of road and logging costs, determination of stumpage values, negotiating logging rates, and supervising logging activities. Experienced in analyzing computer modeling applications.

***Gregory Poremba, Ph.D.,** Subsistence/Socioeconomics Resource Specialist, Human Resources Manager

Ph.D., Sociology, Washington State University, 1990.
M.A., Sociology and Statistics, University of North Dakota, 1982
B.A., Sociology and English, University of Minnesota, Duluth, 1979

Foster Wheeler Environmental: 8 Other: 6
Thirteen years experience managing the preparation of EA's and EIS's and conducting most aspects of social and economic impact analysis. Managed or wrote sections of over 20 EA's, EIS's, and other environmental documents. Conducted fatal flaw reviews of Kelp Bay and Southeast Chichagof EIS's and was the hearing officer for the ANILCA subsistence hearings for the EIS's. EA/EIS experience includes for the Forest Service, Federal Energy Regulatory Commission, U.S. Bureau of Reclamation, U.S. Department of Energy, U.S. Department of Defense, and the Bonneville Power Administration.

Tim Richards, Graphic Artist

Foster Wheeler Environmental: 10 Other: 12
Twenty-two years experience in graphic design. Experience includes graphics, advertising, illustration, interior design, and architectural design. Lead graphic artist in Foster Wheeler Environmental's Bellevue office, providing graphic services for all other west coast Foster Wheeler Environmental offices. Specializes in full-color rendering, map production, and creation of computer-generated color and black and white graphics for environmental and engineering reports and presentations.

8 List of Preparers

Judith Schneider, NEPA/Public Involvement Coordinator and Document Production Manager

B.A., English/History, University of Wisconsin-Oshkosh, 1966

Foster Wheeler Environmental: 6 Other: 20

Twenty-four years of experience in public, political, and community relations; in the development and production of public information materials; and in coordinating the editing and production of interdisciplinary environmental documents. Manages an 18-person editing/document production/public involvement staff to service Foster Wheeler Environmental's Northwest Operations Office in Bellevue, Washington. Assistant project manager for several large interdisciplinary EIS's conducted out of the Bellevue office. Public involvement task manager for numerous EIS's and hazardous waste Superfund projects.

Lynn Skaves, Graphic Artist

A.A., Business, New Hampshire Technical College
Numerous courses, workshops, seminars on computer graphics and desktop publishing

Foster Wheeler Environmental: 6 Other: 9

Four years of experience in computer graphics, desktop publishing, and graphic design. Experienced in producing quality graphics to support environmental and engineering documents and presentation material.

***Tom Stewart,** Ph.D., Geology, Soils and Watershed Resource Specialist, Natural Resources Manager

Ph.D., Physical Geography, University of Alberta, 1988
M.S., Physical Geography, University of Alberta, 1981
B.A., Physical Geography, University of California, 1974

Foster Wheeler Environmental: 5 Other: 11

Sixteen years experience in fluvial geomorphology, sedimentology, hydrology, glacial geology, environmental geology, soil-vegetation-landform relations, and wetlands delineation. Experienced in conducting field and analytical studies of sediment transport; collecting and analyzing data to assess impacts of forestry operations, roads, and structures on stream, slope, and soil stability; and in mitigating these impacts through implementation of BMP's and compliance with State and Federal regulations. Worked for four seasons with the Forest Service on the Tongass and Chugach National Forests conducting soil surveys; mapping soils, vegetation, and stream channels; field-mapping drainage basins; locating roads; conducting soil and erosion control.

Cynthia Swoyer, Technical Editor/Writer

Certification Program, Scientific and Technical Communication, University of Washington, 1990
B.A., Communications/English, University of Hawaii, 1988

Foster Wheeler Environmental: 4 Other: 2

Four years of experience in technical editing, document production, copy writing, graphics design, and business development. Has served as lead editor/writer on numerous large, interdisciplinary, multiauthored EIS's and engineering documents. Supports marketing department in proposal and presentation preparation.

***David Volsen,** Wildlife Biologist

M.S., Candidate, Wildlife Resources, University of Idaho
B.S., Wildlife Biology, University of Alaska, 1983

Foster Wheeler Environmental: 2 Other: 8

Over ten years of experience in the design and implementation of research projects that assess the impacts of hydroelectric development, oil exploration, mining, and forest practices on wildlife habitats and populations. Work includes application of GIS technologies for analysis of wildlife/habitat issues, analysis and implementation of HEP procedures, and conducting wildlife surveys and habitat inventories.

Other Key Contributors

Elizabeth Ablow, Terrestrial and Aquatic Ecologist

B.A., Environmental Studies, Yale University, 1987
B.A., Anthropology, Yale University, 1987

Foster Wheeler Environmental: 4 Other: 2

Six years of experience in conducting stream habitat studies that have included collecting hydraulic, water quality, and stream habitat field data; identifying riparian vegetation; mapping riparian and stream habitats; conducting stream reach stability surveys; and conducting IFIM studies. Conducts extensive fish population surveys on both game and nongame fish species.

***Rowan Baker,** Fisheries Biologist

M.S., Fisheries/Watershed Management, University of California, Berkeley, 1988
B.A., English, Wesleyan University, 1980

Foster Wheeler Environmental: 2 Other: 7

Trained in the design of monitoring programs to assess effects of timber management activities on streams in Alaska. Conducted or supervised over 20 fish population surveys and fish habitat evaluations in steep forested western streams with difficult access and terrain. Experienced in preparation of EIS's to assess project-related fish habitat losses and design of fish habitat mitigation plans; in the application of stream habitat classification systems; and testing stream habitat classification systems usefulness in studies of the distribution and abundance of anadromous salmonid and resident species.

Dan Baird, Visual Resources Specialist

BLA., Landscape Architecture, Utah State University, 1973

Beck and Baird: 13 Other: 13

Twenty-four years of experience with visual resource studies on timberlands, including 5 years with the Forest Service and the Bureau of Land Management. Project experience includes visual resource and recreation analysis for EIS's for projects in the Tongass National Forest and Forest Service projects in Idaho. Expert in impact analysis, mitigation procedures, visual simulations of project alternatives, and NEPA compliance documentation.

8 List of Preparers

Peter Carr, Public Involvement Specialist, Technical Editor/Writer

B.S., Journalism, Medill School of Journalism, Northwestern University , 1987

Foster Wheeler Environmental: 4 Other: 2

Five years of experience assisting with and managing public involvement tasks for EIS's and hazardous waste cleanups. Public Involvement Task Manager for several large water basin EIS's on the Columbia/Snake River system. Technical editor on Kelp Bay and Southeast Chichagof EIS's.

Dominick DellaSalla, Ph.D., Wildlife Biologist

Ph.D., Natural Resources, University of Michigan, 1986
M.S., Ecology, Wayne State University, 1982
B.S., Biology, Adelphi University, 1979

Foster Wheeler Environmental: 4 Other: 9

Thirteen years of experience in wildlife research and management including studies of threatened and endangered species, wildlife habitat inventories, habitat modeling, foraging and population ecology, and endangered species management plans. Work has included habitat and population studies of raptors, bald eagles, spotted owls, woodpeckers, waterfowl, shorebirds, and small mammals. Responsible for several management plans for bald eagle winter roost and nest sites in the Pacific Northwest. Current project work includes applying habitat capability models to assess wildlife habitat for MIS of the Tongass National Forest and developing a habitat capability model for neotropical old-growth associates of the Tongass.

Gary Hathaway, B.S., Landscape Architect

B.S., Landscape Architecture and Environmental Planning, Utah State University, 1961

Over twenty-five years experience in Forest Service recreational and landscape planning. He has served as project manager on large site design projects and has related experience in EIS and NEPA report preparation. His skills include extensive use of computer software and hardwater to model and analyze terrain for visibility and assessment of visual impacts.

Geoff McNaughton, Ph.D., Tree Physiologist and Forest Ecologist

Ph.D., Forest Resources, University of Washington, 1991
M.S., Botany, University of Wyoming, 1984
B.S., Forest Science/Botany, University of Montana, 1981

Foster Wheeler Environmental: 3 Other: 13

Sixteen years of experience in forest management, forest ecology, and tree physiology. Conducted extensive field and laboratory work on the physiological/biophysical ecology of western coniferous forest species, with special emphasis on cold soil temperature effects. Teaching experience includes courses in vegetation ecology, silviculture, forest measurements, plant taxonomy, and forest engineering.

Scott Sundberg, Ph.D., Botanist and Wetland Scientist

Ph.D., Botany, University of Texas at Austin, 1986
B.S., Biology, University of Oregon, 1978

Foster Wheeler Environmental: 2 Other: 16

Eighteen years of experience in plant taxonomy and wetland science. Conducted numerous threatened, endangered, and sensitive plant surveys. Specialist at wetland identification and delineation using methods involving vegetation analysis, hydric soil identification, and assessment of hydrology.

Danene Warnock, Design/Graphic Artist

B.A., Anthropology, University of Washington, 1977
Numerous workshops and seminars on computer graphics and desktop publishing

Foster Wheeler Environmental: 10 Other: 6

Sixteen years of experience in layout design, desktop publishing, graphics production, and telecommunications. Specializes in design of project-related newsletters and public meeting presentation material. Highly experienced in producing quality graphics to support environmental impact statements, hazardous waste documents, maps, and presentation materials.

Ken Winnick, Manager. Foster Wheeler Environmental Geographical Information System (GIS)

M.S., Marine Biology, University of Oregon, 1981
B.S., Physiological Ecology, Union College, 1976

Foster Wheeler Environmental: 7 Other: 11

Eighteen years of experience in the fields of GIS, database management, and computer analysis. Designed and set up Foster Wheeler Environmental's networked GIS system, and continued to develop complex environmental analysis software to be integrated with GIS. Has coordinated data management for many large, multiyear environmental assessment programs. Broad background in physical and biological sciences.

***Liter Yu,** Road and Transportation Engineer, Transportation Team Leader

B.Sc.F., Harvesting, University of British Columbia, 1974

Independent Contractor

Eighteen years of experience in forest industry and consulting. Project manager, transportation engineer, forest engineer, or task leader on numerous harvest unit layout and road design and engineering layout projects. Experienced in preparation of integrated forest development plans, yarding analysis, forest management techniques, route access studies and road location surveys, and determination of logging systems.

8 List of Preparers

Production Assistance

Jim Glassley	GIS	Mary Jo Russell	GIS
Evelyn Roberts	Word Processing	Linda Plantz	Word Processing
Carol Ann Thurston	Word Processing	Lawrence Kellie	Word Processing
Stephanie Parsons	Word Processing	Danene Warnock	Graphics
Tim Richards	Graphics		

Photo Credits

D. DellaSalla	M. Greenig
G. Jackson	J. Lobdell
T. Stewart	S. Sundberg
D. Volsen	

Our thanks to Ketchikan Gateway Borough, Planning Department, for the use of several line art drawings from Atlas of the Ketchikan Region, 1978.

Cover Design: Danene Warnock, Foster Wheeler Environmental

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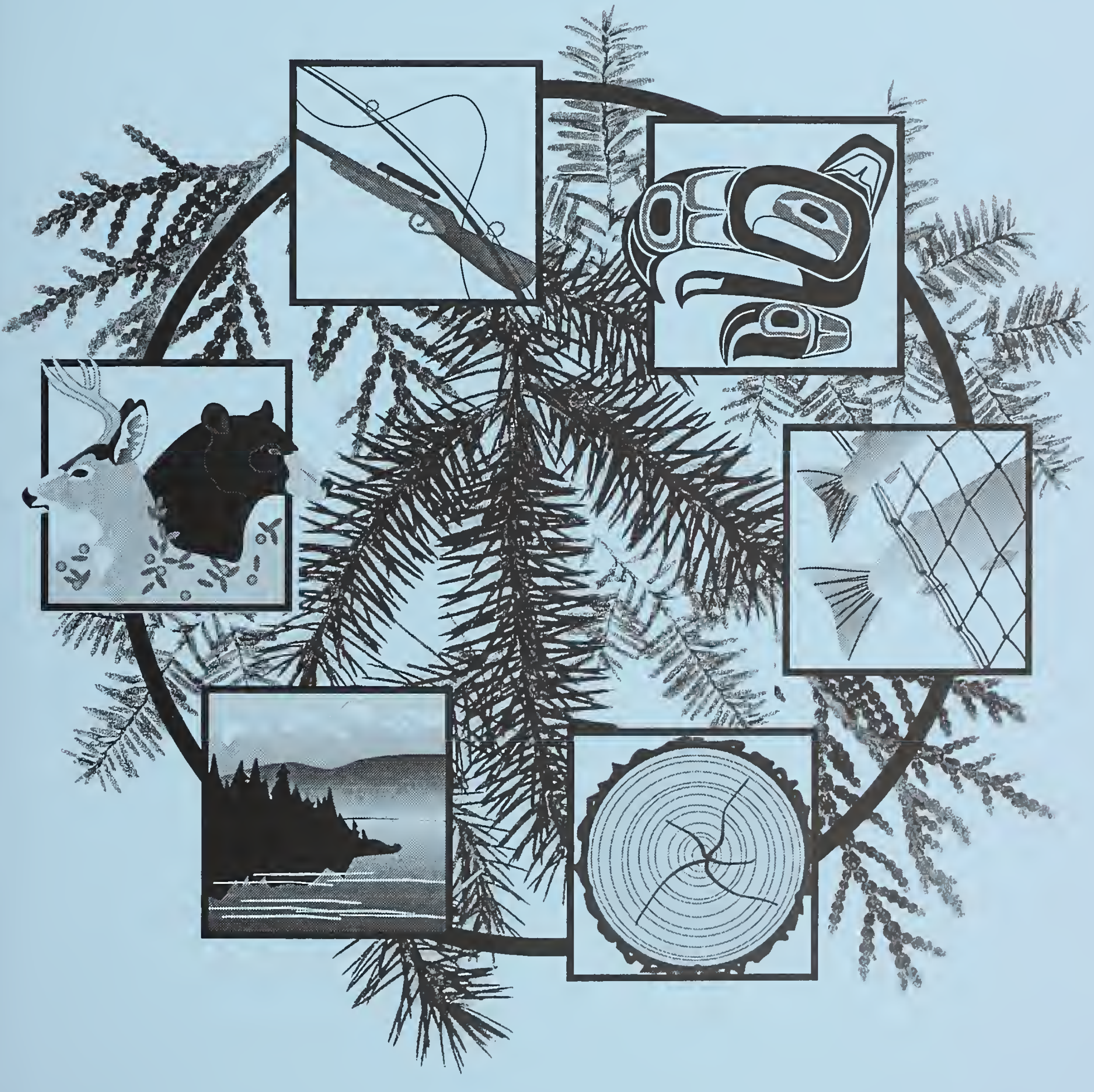

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